Universidade do Minho
Escola de Economia e Gestão

The Financial Impact of Investing in Environmentally Responsible Companies: Evidence from US Market

Pedro Miguel Sousa Almeida

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The Financial Impact of Investing in Environmentally Responsible Companies: Evidence from the US Market

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Trabalho realizado sob a orientação da Professora Doutora Maria do Céu Cortez

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

DIREITOS DE AUTOR E CONDIÇÕES DE UTILIZAÇÃO DO TRABALHO POR TERCEIROS

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Abstract

This dissertation investigates the performance of environmentally screened portfolios composed by US companies between 2003 and 2019, using the aggregate score of the Environmental Pillar of ASSET4 ESG database and its three individual categories (Product Innovation, Resource Reduction and Emission Reduction) to form portfolios. The high-rated and low-rated portfolios represent the companies with better and worst practices in each year. Our results shown that environmentally concerned investors do not pay a premium for holding environmentally responsible portfolios if their portfolios are formed on an equally-weighted basis, but under no circumstances the investor obtains abnormal returns by going long in responsible companies and short in less responsible ones. The robustness tests allow us to conclude that results may not persist under different assumptions. Moreover, we analyze the evolution of portfolio performance over time, which allows us to infer that both high- and low-rated portfolios lose their out or underperformance over time.

Resumo

Esta dissertação investiga o desempenho de carteiras compostas por empresas norte-americanas entre 2003 e 2019 de acordo com o seu desempenho ambiental, usando a medida agregada do Pilar Ambiental da base de dados ASSET4 ESG e as suas três categorias individuais (Inovação de Produto, Redução de Recursos e Redução de Emissões) para formar carteiras. As carteiras de classificação alta e baixa representam as empresas com melhores e piores práticas em cada ano, respetivamente. Os nossos resultados mostraram que os investidores ambientalmente responsáveis não pagam um prémio por manter carteiras ambientalmente responsáveis se suas carteiras são formadas numa base igualmente ponderada, mas, sob nenhuma circunstância, o investidor obtém rendibilidades anormais comprando empresas responsáveis e vendendo empresas menos responsáveis. Os testes de robustez permitem concluir que os resultados podem não persistir sob diferentes premissas. Além disso, procedemos à análise a evolução do desempenho das carteiras ao longo do tempo, o que nos permite inferir que as carteiras de classificação alta e baixa perdem seu desempenho inferior ou superior ao longo do tempo.

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1 Introduction

Socially Responsible Investment (SRI) is not a new topic in the finance universe, and it has been receiving increasing attention, particularly in the last decade. It is defined by the Forum for Sustainable and Responsible Investment as "…an investment discipline that considers environmental, social and corporate governance (ESG) criteria to generate long-term competitive financial returns and positive societal impact." (US SIF, 2018). The 2018 report of the Global Sustainable Investment Alliance (GSIA, 2018) reports an increase of 34.36 % of the global assets in SRI since 2016, reaching an amount of 30,680 trillion dollars (GSIR, 2018). In particular, the US market registered the second highest increase in the same period, with SRI reaching 12 trillion dollars, representing 26% of U.S professionally managed assets. The highest increase in the SRI market is observed in the 'Sustainability' themed investing, known as investment in themes or assets that addresses specific sustainability issues such as climate change, food, water, renewable energy, clean technology and agriculture.

Figures from the US SIF (2018) report show an increase of environmental investing both by retail and institutional investors, with climate change related issues being the most demanded theme by money managers and the third highest by institutional investors. Yet, until recently, there were not many studies in the literature addressing the financial impact of investing with environmental concerns. Indeed, the literature on the link between environmental and financial performance mainly investigated this relationship at the corporate level by analyzing how environmental practices affect firm valuation. Whether investors can benefit from holding stocks of environmentally friendly companies is a different issue. From the investor's point of view most of the research has been directed towards the comparison between conventional investment funds and a subset of SRI funds that give priority to environmental concerns – the so-called green funds. However, evaluating the performance of actively managed green funds might not be the best way to ascertain the impact of environmental screens on portfolio performance, as there are some drawbacks in this approach. For instance funds returns are affected by management fees (Hudson, 2006), as well as the timing and selection skills of the fund managers (Kempf and Osthoff, 2007). To overcome these limitations, the approach followed in this dissertation involves evaluating synthetic portfolios formed on environmental criteria. In terms of methodology, this approach has been used in several studies to evaluate the financial performance of socially screened portfolios (e.g., Derwall, Guenster, Bauer, and Koedijk, 2005; Kempf and Osthoff, 2007; Statman and Glushkov, 2009; Pereira, Cortez, and Silva, 2019). However, most of these studies form portfolios based on an aggregate measure of corporate social responsibility (CSR) or some of its specific individual dimensions. There are fewer studies that form portfolios based specifically on environmental criteria. Thereby we concentrate our efforts in investigating the impact of investing with environmental criteria by forming portfolios of US companies based on their environmental ratings and evaluating the financial performance of such portfolios. To assess companies' environmental performance, we use the environmental scores provided by ASSET4 ESG. This database ranks companies on the Environmental score considering three categories: Resource Reduction, Product Innovation and Emission Reduction. So, besides forming portfolios using the Environmental score of Thomson Reuters ESG database, we will also form portfolios considering these three categories. The financial performance of the portfolios formed on the basis of the Environment score and each of its three categories is evaluated with robust performance evaluation measures. Our research contributes to the literature in several ways. To the best of our knowledge, this is the first study considering the performance of portfolios of US companies based on the Environmental score and its three categories and to evaluate its performance with robust performance measures. Moreover, it contributes to clarify the mixed evidence on the financial performance of green investing. Thus, this study is useful to both academics, retail and institutional investors.

This document is organized as follows. Chapter 2 reviews the literature on the performance of SRI funds and portfolios. Chapter 3 presents the methodology used to form portfolios and evaluate their performance, and chapter 4 describes the data. Chapter 5 presents and analyzes the empirical results. Lastly, chapter 6 presents the main conclusions, the limitations of this study, as well as suggestions for future research.

2 Literature Review

2.1 Theoretical Framework

Two contrasting perspectives concerning CSR support different hypotheses regarding its impact on corporate financial performance. On the one side, there is the traditional perspective of Friedman (1962) that assumes that the ultimate responsibility of the manager of a company is to maximize shareholders' wealth. According to this perspective, any activities related to CSR may violate this assumption since it involves spending the firm's resources in activities that are not the most optimal to maximize earnings. On the other side, there are the supporters of Stakeholder Theory (Freeman, 1984), which argue that a responsible behavior towards all stakeholders of an organization will lead to a more efficient way of managing its resources, thereby leading to a better managed company in the long run.

The demand for environmental investing is highly related with the increasing demand for environmental products (Young, 2009). This behavior of the economic agents is consistent with stakeholder theory (Freeman,1984) and the existence of profit-seeking socially responsible investors (Derwall, Koedijk, and Horst, 2011), who claim it is possible to benefit from a positive impact on the financial performance of the firm when its management considers the specific social or environmental criteria. It is also worth noting the existence of value-driven investors that are willing to sacrifice some profit in order to invest accordingly to their ethical values and beliefs (Clark and Monk, 2010, Derwall, Koedijk, and Horst, 2011). Matters such as climate change prevention, like pollution reduction activities and environmental innovation products (Stanwick and Stanwick, 1998; Ansar, Caldecott, and Tilbury, 2014), and other prevention of environmental issues that affect a large amount of stakeholders may benefit companies' earnings in the long run through a significant increase return on sales and return on assets (Hart and Ahuja, 1996). Hence, these companies can be chosen by profit-seeking and value driven investors.

Conventional finance theory relies on risk and return as the main parameters to consider in the investment process) used by the so called rational investor. According to Modern Portfolio Theory (Markowitz, 1952) and the Capital Asset Pricing Model - CAPM (Sharpe, 1964), investors are risk averse and it is possible to construct a portfolio of assets which maximizes the expected return and minimizes risk if at least part of the investor's savings is directed to a portfolio that includes all assets available in the market. In this way, it is possible to achieve the maximum diversification of the portfolio while minimizing its risk. It follows that the use of any screening strategy, including environmental screens, to select stocks will reduce the universe of assets of the portfolio and limit the portfolio's diversification, making it less efficient (Trinks, Scholtens, Mulder and Dam, 2018). Hence, SRI screens shift the mean-variance frontier left, towards less favorable risk-return tradeoffs than those of conventional portfolios (Geczy, Stambaugh, and Levin, 2003). In fact, several authors, such as Geczy Stambaugh, and Levin, (2003) find that there are significant diversification costs when comparing SRI funds to conventional ones. There is also the argument that an excess demand for environmental type of stocks and a scarcity of investment in companies that do not possess the environmental requirements to be chosen lead the former ones to be overvalued and the latter undervalued (Heinkel, Kraus, and Zechner, 2001; Derwall, Koedijk, and Horst, 2011; Ansar, Caldecott, and Tilbury, 2014). Moreover, some authors defend that the higher cost of capital of controversial firms will lead to lower prices, which will set the stage for higher returns (Derwall, Koedijk, and Horst, 2011). Also, companies that are neglected by norms-constrained investors receive less coverage from analysts when compared to stocks of otherwise comparable characteristics, which might is a further motive to expect higher returns of those stocks (Hong and Kacperczyk, 2009). Consequently, investors might expect lower returns from socially responsible companies and higher returns from less responsible ones, depending on how investors and companies account for the internationalization of the external effects or, in other words, how socially responsible activities are valued (Trinks, Scholtens, Mulder and Dam 2018). Lastly, some argue that non-environmental friendly companies are expected to generate higher returns due to being exposed to other sources of risk, high litigation and reputational risks (Hong and Kacperczyk, 2009) and climate risk (Andersson, Bolton, and Samama, 2016).

There is a considerable amount of recent literature which considers that SRI is positively correlated with social norms, defined as an act whose utility to the agent depends in some way on the beliefs or actions of other members of the community (Akerlof, 1980) concerning ethical and sin stocks. Hence, the social background will differ by market and thereby SRI performance will be relatively different accordingly with the social conjecture within this strategy is being carried on (Auer and Schuhmacher, 2016; Durand, Koh, and Limkriangkra, 2013).

2.2 Empirical Evidence

There is a considerable number of studies that address the impact of social screens on portfolio financial performance. The theme has become more important for academics as it is more relevant than ever among investors. In this section we discuss previous studies regarding SRI exploring the methodologies used, and the results and conclusions reached by the authors.

2.2.1 The performance of socially responsible mutual funds

Regarding studies on the performance of SRI mutual funds we observe a significant tendency for an overall neutral performance of SRI when compared to the market or conventional investments (e.g., Hamilton, Jo, and Statman, 1993; Statman, 2000; Cortez, Silva and Areal, 2009, Capelle-Blancard and Monjon, 2012; and Revelli and Viviani, 2015). There is also evidence that SRI funds perform better in times of crisis when compared to conventional ones (Nofsinger and Varma, 2014; Muñoz, Vargas and Marco, 2014) and have lower risk (Nofsinger and Varma, 2014; Becchetti, Ciciretti, and Giovannelli, 2013).

Concerning the Environmental dimension, there are several studies that focus specifically on the performance of green funds. In the US market Chang, Walt and Witte (2012), using the Sharpe ratio (Sharpe, 1966), find that green mutual funds underperform conventional ones. The more recent studies of Silva and Cortez (2016) and Ibikunle and Steffen (2017) come to the same conclusion for European funds. Silva and Cortez (2016) find a negative performance of European green funds using the conditional four-factor model while Ibikunle and Steffen (2017) notice that the gap between the two types of funds narrows over the years. Munoz, Vargas, and Marco (2014) use the same model to measure the performance of US and European green funds against their conventional peers and find no significant differences between their performance. Climent and Soriano (2011) and Lesser, Rößle and Walkshäusl (2016) also use the unconditional four-factor model of Carhart (1997) and find that performance depends on the time period analyzed, as the performance of green funds increases over time, although never outperforming conventional peers. The latter also documents the existence of key screening drivers of the Environmental and Social dimensions. The authors report that energy screens drive green funds' performance while social screens drive the performance of social responsible funds, suggesting a great importance of the screening applied by the fund manager.

Several recent studies address the performance of funds that invest in specific sectors associated to clean technologies, namely renewable energy. For instance, Reboredo, Quintela and Otero (2017) , using the four-factor model of Carhart (1997), come to the conclusion that the performance of alternative energy mutual funds is negative when compared to socially responsible funds and conventional funds, consistent with the idea that investors are paying a premium for going green via renewable energies. Still regarding clean energy screened investments, Marti-Ballester (2019a) compares the performance of European renewable energy mutual funds with several market benchmarks (the S&P 1200 and the Fossil Fuel Energy S&P Global 1200 Energy Index) and conclude that the renewable energy mutual funds are not able to outperform the benchmarks. This author conducted a similar study (Martí-Ballester, 2019b) on European renewable energy funds using the Carhart (1997) model and finds that using unconditional models, renewable energy funds are able to beat the specific style benchmark, although underperforming the conventional market benchmark. Using conditional models, the results indicate that renewable energy funds perform similarly to the market using conventional and specialized global market indexes as benchmarks.

2.2.2 The performance of synthetic portfolios formed on social screens

Several authors point different reasons why performance evaluation of SRI using mutual funds might lead to biased conclusions. Baks (2003) finds that the manager skills in selecting stocks can contribute in a range of 10 to 50 percent to fund performance. Consequently, the results of the performance evaluation might reflect the fund manager's selection abilities (Kempf and Osthoff, 2007). Besides, fund performance is also affected by the amount of fees in such way that funds with lower fees tend to perform better. Lastly, there is evidence suggesting the asset allocation chosen by the fund manager is not necessarily coherent with the social screening strategy disclosed on the prospectus of the fund (Auer and Schuhmacher, 2016). To overcome these limitations, a stream of the literature evaluates the performance of SRI by forming synthetic portfolios of companies with different levels of social and environmental ratings and evaluating their performance.

Kempf and Osthoff (2007) use the Carhart (1997) model to measure the performance of portfolios complying with strategies based on past CSR performance (including the environment).To do so, the authors collect ratings from the KLD database and find that a strategy of investing in companies with high past environmental performance and selling companies with low past environmental performance does not lead to positive alphas, despite the constrasting evidence concerning portfolios screened based on the ESG overall rating, which lead to positive and significant alphas. The authors also find that a best-in-class approach based on environmental rankings leads to positive abnormal returns and this portfolio would be significantly exposed to the all risk factors of the four-factor model (Carhart, 1997) except for the high minus low book to value factor, suggesting that it would not be significantly different picking companies based on their forecasted growth or intrinsic value when applying this strategy.

Derwall, Koedijk, and Horst (2011) provide evidence of abnormal returns of portfolios of socially responsible companies as well as of portfolios of shunned-stocks, noting that the profitability of SRI decreases over time diminishing investors' errors-in-expectations and values-driven investors shunning stocks in controversial sectors.

Also evaluating the performance of portfolios based on several CSR criteria, and using industry-adjusted scores to account for industry biases, Statman e Glushkov (2009) find that it is possible to do good in environmental terms while benefiting from a good financial performance. Moreover, the authors mentions the "no effect" hypothesis whereby the expected returns of socially responsible stocks are approximately equal to the expected returns of other stocks, which is consistent with a world in which the social responsibility feature of stocks has no effect on returns.

More recently, Halbritter and Dorfleitner (2015) show that investors do not obtain abnormal returns from the difference of high and low rated firms based on social and environmental criteria. Furthermore, the authors notice a declining outperformance of companies with high CSR scores by dividing the period under evaluation in sub periods. Finally, they find that the results are strongly dependent on the particular ESG rating provider used (KLD, Bloomberg, or ASSET4).

Galema, Plantinga, and Scholtens (2008) use the KLD database to evaluate a SRI strategy. The authors find a neutral relationship between environmental score and stock returns. They argue that this relationship is actually not fully captured by alpha as generated from regressions in the spirit of the Fama and French (1993), but also by decreases in the fundamentals such as the book-to-market ratio caused by excessive demand on the respective stocks. This demand reduces the risk exposure of responsible stocks to the so-called 'value factor' (HML factor) of the three-factor model.

Other studies focus solely on the environmental dimension to form synthetic portfolios. Derwall, Guenster, Bauer and Koedijk (2005) provide evidence that portfolios of US green companies (with high 'eco-efficiency' scores) perform better than companies with low-rated environmental ratings, and a long-short strategy would generate abnormal returns.

Haan, Dam and Scholtens (2012) use first and second stage regressions similar to Fama and MacBeth (1973) and find a negative relationship between corporate environmental performance and returns for the 500 largest companies traded in the U.S market. In this study, environmental performance is measured by the Newsweek Green Rankings. Also using this ranking, Puopolo, Teti and Milani (2015) find no linear relationship between environmental performance and stock returns of the companies included in the S&P500, as portfolio returns were completely explained by the risk factors..

There are a few recent papers that address the performance of environmentally friendly portfolios in the energy sector. Regarding fossil-fuel divestment strategies, Hunt and Weber (2019) test six different divestment strategies in the Canadian market, from a negative screenning approach to intensive investment in green industries.The authors find positive risk-adjusted returns of portfolios that do not include high carbon fossil fuel investments. Hence, in the view of the authors, carbon divestment make sense even without taking into account environmental reasons, and just considering purely rational risk and return motivations.

Halcoussis and Lowenberg (2018) come to very similar conclusions for the U.S market when forming synthetic portfolios for fossil fuel and fossil fuel free companies and comparing the returns with those of the S&P500 benchmark, although the financial measure of performance was not adjusted for risk. Trinks, Scholtens, Mulder, and Dam (2018) also find that excluding fossil-fuel companies does not penalize portfolios. Moreover, the diversification costs of engaging in such strategy are not so significant. Finally the authors realize that it is important to systematically analyze the implications of fossil fuel divestment for portfolio performance based on standard methods in the finance literature, using a comprehensive sample and study period, and assessing the robustness of the results.

Besides this unconclusive evidence, little can be said about the performance of portfolios formed on specific categories of the environmental dimension. It is not conclusive whether investors will suffer costs or gain benefits by assuming an environmental attitude when investing, as the empirical evidence documents mixed financial performance of environmentally screened portfolios. Hence, there is a need for more research on the performance of portfolios formed on the basis of environmental categories. The main goal of this study is therefore to provide up-to-date evidence regarding the impact of using environmental screens in portfolio financial performance. We aim to clarify the question of whether the investor is paying more by going green and what are the performance consequences of having more money allocated to SRI screened on this dimension.

3 Methodology

3.1 Portfolio Formation

To examine the performance of environmentally responsible firms, we start by applying the positive screening approach to form synthetic portfolios, with resemblance to the studies of Derwall, Guenster, Bauer and Koedijk (2005), Kempf and Osthoff (2007) and Pereira, Cortez, and Silva (2019).

Each year we rank companies based on their environmental scores and each of its three categories scores (Resource Use, Innovation and Emissions) in the previous year. Then, we form portfolios using a positive screening approach, by considering a high-rated and low-rated portfolio, using the 30th percentile cut-off of the dataset as a breaking point. This procedure is repeated each year, so that for each portfolio we end up with a time series of monthly returns over the period under evaluation. Furthermore, we form a difference portfolio, corresponding to the differences in the returns between the high and low-rated portfolio, to better assess performance differentials between both portfolios.[1]

We form both value-weighted and equally-weighted portfolios. The difference in these two portfolio construction approaches relies on the weight given to each asset. In the value-weighted approach, showed in equation 1, the weight allocated to each asset i, (Wi), is based on the proportion of the equity capitalization of the company in the total equity capitalization of the portfolio in the same period (Wp). Using the equally-weighted method, the weight allocated is the same to each asset, as demonstrated in equation 2, where W_i, is the weight allocated to each company, and N is the total number of companies in the portfolio.

$$W_i = \frac{MV_i}{MV_p} \tag{1}$$

$$W_i = \frac{1}{N} \tag{2}$$

[1] As a robustness test, we further form portfolios based on a best-in-class approach and evaluate an alternative 30% cut-off of the best and worst companies of each industry according to the ICB system (11 industries). We also use alternative cut-off portfolio for robustness tests purposes.

3.2 Financial Performance

The Return Index series provided by Thomson Reuters DataStream reflects the theoretical growth in value of a share over a specified period, assuming that dividends are re-invested to purchase additional units of an equity or unit trust at the closing price applicable on the ex-dividend date. Therefore, this measure includes not only the capital gain achieved by the growth in the price of the stock but also the dividend portion paid by the company. With this indicator we are able to compute the rate of return in period t, using the formula shown in equation 3, where $\boldsymbol{r_{i,t}}$ is the return of the asset $\boldsymbol{i}$ on month $\boldsymbol{t}$.

$$\boldsymbol{r_{i,t}} = \frac{(\boldsymbol{ri_{,t}} - \boldsymbol{ri_{,t-1}})}{\boldsymbol{r_{i,t}}} \tag{3}$$

Jensen's (1968) alpha is a widely used measure to evaluate portfolio performance. It is based on the CAPM and thus the relevant source of risk is market risk. However, Fama and French (1992) present evidence suggesting that incorporating other effects like size (Banz, 1981)and book-to-market value (Stattman, 1980 and Chan, Hamao, and Lakonishok, 1991) to the CAPM model is useful to explain the cross-section of average returns. Recent studies on the performance of SRI also find more adequate to use multi-factor models to explain the financial returns of the companies and portfolios, as in Climent and Soriano, (2011) and Silva and Cortez (2016). Accordingly, we choose to apply the well-recognized Carhart four-factor model (1997) to measure the financial performance of the portfolios. This model, which adds the momentum factor to the three-factor model of Fama and French (1993), is given by the following equation:

$$\boldsymbol{r_{p,t}} = \boldsymbol{\alpha_p} + \boldsymbol{\beta_{p,m}}\, \boldsymbol{r_{m,t}} + \boldsymbol{\beta_{p,SMB}}\, \boldsymbol{SMB_t} + \boldsymbol{\beta_{p,HML}}\, \boldsymbol{HML_t} + \boldsymbol{\beta_{p,MOM}}\, \boldsymbol{MOM_t} + \boldsymbol{\varepsilon_{p,t}} \tag{4}$$

where $\boldsymbol{r_{p,t}}$ represents the excess return of portfolio *p*, $\alpha_{\boldsymbol{p}}$ represents the fund performance measure (alpha), $\boldsymbol{r_{m,t}}$ represents market excess returns, $\boldsymbol{SMB_t}$, $\boldsymbol{HML_t}$ and $\boldsymbol{MOM_t}$, represent the size (difference between small capitalization companies and high capitalization companies), the value (the difference between companies with high and low book to market) and momentum (the difference between the winner companies and the loser companies) factors, respectively, while the $\boldsymbol{\beta_p}$ represent the coefficients of the risk factors.

Ferson and Schadt (1996) develop conditional models that are able to capture the state of the economy by taking into account the information that was available to investors at the time the returns were generated. The authors propose a conditional performance evaluation model that assumes a linear functional form for the changing conditional beta of a portfolio, given a set of public information variables that proxy for the state of the economy. The conditional version of the four-factor model specifies as follows:

$$\boldsymbol{r_{p,t} = \alpha_p + \beta_{0p} r_{m,t} + \beta'_p r_{m,t} z_{t-1} + S_{0p} SMB_t + S'_p SMB_t z_{t-1} + H_{0p} HML_t + H'_p HML_t z_{t-1} + M_{0p} MOM_t + M'_p MOM_t z_{t-1} + \varepsilon_p}, \tag{5}$$

The coefficients $\boldsymbol{\beta_{0p}}$, $\boldsymbol{S_{0p}}$, $\boldsymbol{H_{0p}}$, $\boldsymbol{M_{0p}}$ can be interpreted as the average coefficients (or when all information variables are at their means). This equation adds the vector $\boldsymbol{Z_{t-1}}$, which contains the public information variables, to the unconditional four-factor model. This vector represents the lagged information variables measured as deviations from their averages: $\boldsymbol{z_{t-1} = Z_{t-1} - E(Z)}$. The vectors $\boldsymbol{\beta'}_p$, $\boldsymbol{S'_p}$, $\boldsymbol{H'_p}$, and $\boldsymbol{M'_p}$ capture the response of the conditional betas to the lagged information variables.[2]

Ferson and Schadt (1996) and several other studies provide evidence that conditional models have a higher explanatory power than unconditional models when used to measure financial performance (Cortez, Silva, and Areal, 2009, Cortez, Silva, and Areal, 2012, and Bauer, Derwall, and Otten (2007).

Christopherson, Ferson and Glassman (1998) extend the approach of Ferson and Schadt (1996) to allow alphas to vary over time, conditioned by the economic information available. This model is consistent with markets being semi-strong efficient, as the performance of a fund manager that uses public available information to select securities will have a null alpha since premium returns are not managers' skill of time and selectivity. Thus, the conditional version of the four-factor model of Carhart (1997) with time-varying alphas and betas is presented in the following equation:

[2] This approach assumes that time-varying betas are linear functions of lagged public information variables, which can be considered a limitation of the model.

$$\boldsymbol{r_{p,t}} = \alpha_{\boldsymbol{0p}} + \alpha'_{\boldsymbol{p}}\boldsymbol{z_{t-1}} + \boldsymbol{\beta_{0p}r_{m,t}} + \boldsymbol{\beta'_{p}r_{m,t}z_{t-1}} + \boldsymbol{S_{0p}SMB_t} + \boldsymbol{S'_{p}SMB_t z_{t-1}}$$
$$+ \boldsymbol{H_{0p}HML_t} + \boldsymbol{H'_{p}HML_t z_{t-1}} + \boldsymbol{M_{0p}MOM_t} + \boldsymbol{M'_{p}MOM_t z_{t-1}} + \boldsymbol{\varepsilon_{p,t}} \quad \textbf{(6)}$$

Equation 6 differs from equation 5 by adding the vector $\alpha'_{\boldsymbol{p}}\boldsymbol{z_{t-1}}$ that measures the response of the conditional alpha to the information variables.

In this study, we follow the studies of Cortez, Silva, and Areal (2012) and Ferson and Warther (1996), and use the dividend yield and the short-term rate as public information variables, which the mentioned authors argue to be useful in predicting stock returns.

4 Data Description

4.1 Environmental characteristics of the dataset

This investigation evaluates the performance of environmentally responsible portfolios of stocks traded in the US market. To rank companies by their environmental ratings we use the Asset4 ESG database. This database covers more than 7000 companies globally, with time series data going back to 2002. Since ASSET4 also includes dead companies, it is reasonable to consider that this study is free from survivorship bias. This database has also been used in several SRI studies such as Halbritter and Dorfleitner (2015) Gonecn and Scholtens (2017), and Pereira, Cortez and Silva (2019). [3] The ESG score of ASSET4 is calculated based on 18 category scores (3 Environmental, 3 Economic, 5 Governance and 6 Social) and each category is divided into a specific number of relevant measures. Each dimension is divided in a specific number of categories. The Environmental dimension, which "*…measures a company's impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems. It reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental opportunities in order to generate long term shareholder value.*"[4] is composed by Emission Reduction Score, which addresses the question: "*Does the company have a policy for reducing environmental emissions or its impacts on biodiversity? And does the company have a policy for maintaining an environmental management system*?", the Product Innovation Score that *"measures a company's management commitment and effectiveness towards supporting the research and development of eco-efficient products or services. It reflects a company's capacity to reduce the environmental costs and burdens for its customers, and thereby creating new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability*", and the Resource Use score, that "*measures a company's management commitment and effectiveness towards achieving an efficient use of natural resources in the production process. It reflects a company's capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management*". The ASSET4 indicators, categories, pillars and overall Score are calculated by equally-weighting and z-scoring all underlying data points and comparing them against all companies in the ASSET4 universe. The resulting percentage is therefore a relative measure of performance, z-scored, which is a relative measure comparing one company with a given benchmark, expressing the value in units of standard deviation of that value from the mean value of all companies, and normalized to better distinguish values and position the score between 0 and 100%.

[3] Halbritter and Dorfleitner (2015) point out that the results concerning the financial performance of the SRI might be influenced by the database employed to collect the scores of the companies

[4] www.thomsonreuters.com

We retrieve data on companies' Environmental Scores and on each of its three categories (Resource Reduction, Emission Reduction and Product Innovation) to trace the key drivers of the Environmental dimension and its individual influence on portfolio financial performance.

We consider every company included in the US market whose Environmental performance is evaluated during the sample period by Asset4 database. Thereby, and considering that this database has been including an increasing number of companies every year, there is a lot of non-available information for the complete dataset in the first years. Hence, we consider every company with available information each year, ending up with 16507 observations for the Environmental dimension, and 16506, 15892 and 16529 observations for the Product Innovation, Resource Reduction and Emission Reduction categories, respectively.

Table 1 reports basic descriptive statistics on the Environmental dimension and each of its three categories for the companies in the dataset. The mean value of the Environmental dimension reported by Halbritter and Dorfleitner (2015) for the period 2002-2011 is 40.05, slightly higher than the 39.16 figure we observe in our dataset from 2002 to 2018. It is also notable that both the mean scores of the Product Innovation and Resource Reduction Categories are above the Environmental Dimension, while the mean score of the Emission Reduction Category is below. The distribution of the categories seems similar in the sense that they all present a flat shape and are skewed to the right.

Table 1. Descriptive Statistics of Environmental and Category Scores

This table presents summary Statistics for the Environmental dimension and its Product Innovation, Emission reduction and Resource Reduction categories of the companies in the sample from 2002 to 2018.

Variables	Obs	Mean	Std.Dev.	Min	Max	Skew.	Kurt.
Environmental	16507	39.158	30.775	8.15	97.43	.708	1.872
Product Innovation	16506	41.223	28.393	8.77	99.68	.938	2.271
Resource Reduction	16511	40.187	31.88	6.54	97.43	.557	1.65
Emission Reduction	16506	37.996	30.19	7.24	97.97	.832	2.036

Tables 2, 3, 4 and 5 present basic descriptive statistics of the environmental scores of the portfolios of high- and low-rated companies that result from the use of the positive screening strategy considering different cut-off rates.[5] Concerning the mean of high-rated portfolios, the values among the homologous cut off portfolios for different categories and Pillar are very close, ranging roughly between 60.038 and 63.673 in the case of the high-rated portfolio with a 50% cut-off, 78.902 and 80.626 for the 30% cut-off, and 92.852 and 95.656 to the 10% cut-off. Regarding the low scores, we note that there is a higher scope of values between Pillar and Categories among similar cut-off portfolio mainly driven by the Resource Reduction Category. In this context, the lowest mean values in the low-rated portfolio are always associated with the Resource Reduction Category and the highest are linked to the Product Innovation Category. This tendency may suggest that the poorer Resource Use policies employed by low-rated companies is somehow being compensated by the innovation in the products used to keep the operations environmentally sustainable. Furthermore, there is a tendency concerning the symmetry of the portfolios. We observe that all the portfolios composed by companies above the median tend to present negative skewness, regardless the dimension or category used, as the majority of observations are higher than mean. The same is observed in the low-rated portfolios, although in the opposite direction (positive skewness). The values of the kurtosis only seem to be regular in the high-rated 50% portfolio, being platykurtic and presenting fatter tails and more dispersion in the distribution, which can be observed in Appendix A. The concentration of observations around the mean among all the other portfolios varies accordingly with the environmental criteria they were built on.

[5] As mentioned previously, although the main analysis is focused on portfolios formed on the 30% cut-off, we also perform robustness tests with portfolios formed on the 50% and 10% cut-offs.

Table 2. Descriptive statistics of portfolios formed on Environmental scores

This table reports summary statistics for equally- and value-weighted portfolios based on the Environmental dimension and using the positive screening strategy. Portfolios are formed considering 50%, 30% and 10% cut-offs. The sample period is from 2002 to 2018.

	Obs	Mean	Std.Dev.	Min	Max	Skew.	Kurt.
High Rated 50% Cut	8126	63.673	25.829	16.99	97.43	-.341	1.662
High Rated 30% Cut	4114	80.383	15.206	31.09	97.43	-1.125	3.186
High Rated 10% Cut	1503	93.348	1.874	83.1	97.43	-.921	5.095
Low Rated 50% Cut	8059	14.589	5.257	8.15	42.29	2.339	9.517
Low Rated 30% Cut	4913	12.174	2.139	8.15	19.12	.995	4.18
Low Rated 10% Cut	1845	11.598	2.253	8.15	18.23	.915	3.394

Table 3. Descriptive statistics of Product Innovation scores on portfolios

This table reports summary statistics for equally- and value-weighted portfolios based on the Product Innovation category and using the positive screening strategy. Portfolios are formed considering 50%, 30% and 10% cut-offs. The sample period is from 2002 to 2018.

	Obs	Mean	Std.Dev.	Min	Max	Skew.	Kurt.
High Rated 50% Cut	8268	61.34	27.309	21.69	99.68	-.071	1.48
High Rated 30% Cut	4932	79.087	18.649	30.48	99.68	-.94	2.865
High Rated 10% Cut	1642	95.656	3.049	78.78	99.68	-2.685	12.277
Low Rated 50% Cut	7902	20.328	3.584	8.77	34.74	.46	3.614
Low Rated 30% Cut	5026	19.006	3.084	8.77	26.95	.108	2.573
Low Rated 10% Cut	1874	17.493	2.748	8.77	24.26	.388	2.182

Table 4. Descriptive statistics of Resource Reduction scores on portfolios

This table reports summary statistics for equally- and value-weighted portfolios based on the Resource Reduction category and using the positive screening strategy. Portfolios are formed considering 50%, 30% and 10% cut-offs. The sample period is from 2002 to 2018.

	Obs	Mean	Std.Dev.	Min	Max	Skew.	Kurt.
High Rated 50% Cut	8681	63.142	27.064	11.99	97.43	-.506	1.846
High Rated 30% Cut	5045	80.626	16.2	19.92	97.43	-1.928	6.896
High Rated 10% Cut	1636	92.852	1.626	87.57	97.43	-.206	3.541
Low Rated 50% Cut	7504	13.764	6.848	6.54	49.99	2.532	9.97
Low Rated 30% Cut	5499	11.898	3.567	6.54	21.2	1.396	3.94
Low Rated 10% Cut	2057	11.073	3.396	6.54	20.4	1.6	4.762

Table 5. Descriptive statistics of Emission Reduction scores on portfolios

This table reports summary statistics for equally- and value-weighted portfolios based on the Emission Reduction category and using the positive screening strategy. Portfolios are formed considering 50%, 30% and 10% cut-offs. The sample period is from 2002 to 2018.

	Obs	Mean	Std.Dev.	Min	Max	Skew.	Kurt.
High Rated 50% Cut	8307	60.038	27.8	16.78	97.97	-.201	1.5
High Rated 30% Cut	4790	78.902	16.894	33.55	97.97	-1.14	3.197
High Rated 10% Cut	1648	93.268	2.015	85.84	97.97	-.253	2.872
Low Rated 50% Cut	8328	15.125	3.955	7.24	33.87	1.703	7.193
Low Rated 30% Cut	5486	13.728	2.772	7.24	21.8	.86	3.706
Low Rated 10% Cut	2086	12.691	2.581	7.24	19.67	.666	3.078

4.2 Industry characteristics of the dataset

The companies in the dataset belong to eleven different industries according to the Index Classification Benchmark: Technology, Telecommunications, Health Care, Financials, Real Estate, Consumer Discretionary, Consumer Staples, Industrials, Basic Materials, Energy and Utilities. Table 6 presents the number of companies by industry. The industry allocation of the high- and low-rated portfolios is presented in Appendix B. By looking to the industry allocation of each portfolio, we notice some significant differences. Low-rated portfolios are increasingly exposed to the financials industry, which represents around 50% of the composition of the 10% low-rated portfolios (with exception of the Product Innovation Category). The companies of high-rated portfolios are more dispersed across industries, but industrials seem to predominate in environmental responsibility, despite the technology industry increasing significantly its weight when it comes to extremely good conducts.

Table 6. Number of companies for each industry

This table reports the number and percentage of companies corresponding to the industries classified in the ICB for the Environmental dimension, Product Innovation, Resource Reduction and Emission Reduction categories.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
	Freq.	**(%)**	**Freq.**	**(%)**	**Freq.**	**(%)**	**Freq.**	**(%)**
Technology	1647	10.20	1642	10.18	1656	10.26	1680	10.12
Telecommunications	439	2.72	440	2.73	442	2.74	448	2.70
Health Care	1807	11.19	1808	11.21	1855	11.49	1834	11.05
Financials	2622	16.24	2619	16.24	2607	16.15	2698	16.26
Real Estate	1108	6.86	1109	6.87	1098	6.80	1147	6.91
Consumer Discretionary	2763	17.11	2761	17.12	2756	17.07	2857	17.21
Consumer Staples	782	4.84	781	4.84	768	4.76	801	4.83
Industrials	2591	16.05	2587	16.04	2582	15.99	2674	16.11
Basic Materials	702	4.35	700	4.34	688	4.26	719	4.33
Energy	1016	6.29	1015	6.29	1028	6.37	1053	6.34
Utilities	669	4.14	669	4.15	665	4.12	686	4.13
Total	16146	100.00	16131	100.00	16145	100.00	16597	100.00

4.3 Financial characteristics of the dataset

After identifying all US companies rated by ASSET4, we use Thompson Reuters DataStream to collect the monthly returns of those companies. Excess returns on the companies are computed as the difference between the monthly returns (based on the Return Index, which includes the dividends paid during the sample period) and the risk-free rate, proxied by the 1-month Treasury Bill available in Professor Kenneth French's data library. [6]

Tables 7 to 15 present descriptive statistics for the financial returns of value and equally-weighted portfolios formed on the Environmental dimension and its three categories with respect to the three different cut-offs (50%, 30% and 10%), using the positive screening strategy. Both low- and high-rated portfolios follow some of the stylized effects mentioned by Cont (2001), such as the tendency of a higher concentration of returns around the mean and skewed to the right, as reflected by the negative skewness and leptokurtosis of the distribution. As expected, the p-values of the Jarque-Bera test performed very close to 0, indicating non-normality of the returns, with exception of the low-rated value-weighted portfolio formed on the Emission Reduction category and using a 10% cut-off. Consequently, in order to infer our empirical results, we use t-distribution which is very similar to the normal distribution but presents higher kurtosis and therefore fatter tails.

The rule of thumb seems to be a higher monthly mean return when the index is equally-weighted, stressing the higher returns of companies with lower market value, suggesting that investors that choose the equally-weighted approach to construct the index might have higher absolute returns. The standard deviation is also higher for the equally-weighted portfolios which can give us an early lead about the risk-adjusted returns. The higher mean return of low-rated portfolios is also a trend during the sample period analyzed, despite the higher standard deviation. Moreover, it looks like the existence of a tendency in which the highest the portfolio overall scores (lowest cut-off), the lower the mean returns, mainly for low-rated portfolios, even though it is also observable when comparing the 50% and the 30% cut-off portfolios of the high-rated companies. By looking at the standard deviation, we observe that as the cut-off of high-rated portfolios decreases and less companies are considered in the portfolio, the standard evolution tends to diminish, which can induce in the defensive features of the portfolios composed by companies with higher environmental standards.

Tables 12,13 and 14 report descriptive statistics for value- and equally-weighted portfolios based on the strategy of going long in high-rated companies and short on low-rated companies, with a 50%, 30% and 10% cut-offs respectively. This strategy seems to produce

[6] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

negative mean monthly returns, with few exceptions, whatever the weights on the companies composing the portfolio. The portfolios also present a lower standard deviation and range of outcomes when compared to the other strategies. Considering the excess kurtosis and the skewness close to zero, the density seems to be close to the normal distribution, although only the Emission Reduction equally-weighted and Product Innovation value-weighted portfolios have a Jarque-Bera p-value that is sufficiently high to not reject the null hypothesis of normality. Thus, it is important to note the argument of Adcock, Cortez, Armada, and Silva (2012), that the non-normality of portfolio returns supports the use of conditional models. Therefore, by choosing to apply the full conditional specification of the four-factor model, we are minimizing errors that may arise from the violation of the assumption of normality.

4.4 Other data

Concerning the benchmark, we use the market, size, value and momentum factors obtained from Professor Kenneth French's database. Regarding the information variables, we use two public information variables: the short term rate and the dividend yield, as in Ferson and Warther (1996) and Cortez, Silva and Areal (2012). The short-term rate is proxied by the yield of a 3-month US Treasury bill and the dividend yield is based on the S&P 500 index. We follow the suggestion of Ferson, Sarkissian and Simin (2003) and stochastally detrend these variables to avoid spurious regressions. The public information variables are also used in their zero-mean form.

Table 16 provides basic descriptive statistics for the risk factors, risk-free rate and the public information variables used. The returns are very variable among the factors, highlighting the fact that none of the series follows the normal distribution with exception of the small minus big factor.

Table 7. Descriptive Statistics of the returns of high-rated portfolios (50% cut-off)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for high-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 50% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.	Obs
Environmental Equally-weighted	1.17	4.95	-21.37	21.62	-0.34704	6.25369	0	8126
Environmental Value-weighted	0.87	3.97	-16.76	11.99	-0.70103	5.15361	0	8126
Product innovation Equally-weighted	1.17	5.05	-21.83	22.47	-0.30729	6.33598	0	8268
Product innovation Value-weighted	0.89	3.83	-16.77	11.91	-0.77557	5.62435	0	8268
Resource Reduction Equally-weighted	1.15	4.93	-21.7	21.65	-0.38794	6.39025	0	8681
Resource Reduction Value-weighted	0.9	3.95	-16.54	13.43	-0.69369	5.26063	0	8681
Emission Reduction Equally-weighted	1.15	4.93	-21.7	21.65	-0.38794	6.39025	0	8307
Emission Reduction Value-weighted	0.92	3.88	-16.87	11.99	-0.79586	5.40689	0	8307

Table 8. Descriptive Statistics of the returns of high-rated portfolios (30% cut-off)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for high-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 30% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.	Obs
Environmental Equally-weighted	1.12	4.81	-20.69	21.07	-0.38215	6.33076	0	4909
Environmental Value-weighted	0.85	4.03	-15.71	11.54	-0.65437	4.87222	0	4909
Product innovation Equally-weighted	1.13	5.02	-21.53	22.81	-0.31745	6.48641	0	4932
Product innovation Value-weighted	0.7	3.57	-15.87	11.31	-0.72564	5.36088	0	4932
Resource Reduction Equally-weighted	1.13	4.84	-20.6	20.89	-0.32892	6.10209	0.0001	5045
Resource Reduction Value-weighted	0.91	3.88	-15.8	10.83	-0.71279	4.85273	0	5045
Emission Reduction Equally-weighted	1.12	4.59	-20.13	17.93	-0.53483	5.92623	0	4790
Emission Reduction Value-weighted	0.88	3.77	-16.16	10.75	-0.76204	5.11782	0	4790

Table 9.Descriptive Statistics of the returns of high-rated portfolios (10% cut-off)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for high-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 10% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.	Obs
Environmental Equally-weighted	1,07	4,63	-19,66	17,74	-0,48793	5,58318	0	1643
Environmental Value-weighted	0,83	3,78	-15,68	9,83	-0,70289	4,65815	0	1643
Product innovation Equally-weighted	1,15	5,02	-21,46	20,89	-0,41086	6,06143	0	1642
Product innovation Value-weighted	0,77	3,97	-18,04	10,91	-0,85975	5,51213	0	1642
Resource Reduction Equally-weighted	1,11	4,45	-20,83	14,98	-0,74033	6,20777	0	1636
Resource Reduction Value-weighted	1,17	4,82	-23,67	18,75	-0,40811	7,1921	0	1636
Emission Reduction Equally-weighted	1,17	4,34	-19,59	15,41	-0,70963	6,00234	0	1648
Emission Reduction Value-weighted	0,93	3,9	-17,63	10,64	-0,86106	5,54021	0	1648

Table 10.Descriptive Statistics of the returns of low-rated portfolios (50% cut-off)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for low-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 50% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.	Obs
Environmental Equally-weighted	1.18	5.17	-23.53	21.37	-0.57489	6.29573	0	8059
Environmental Value-weighted	1.05	4.76	-22.17	21.99	-0.44614	7.45764	0	8059
Product innovation Equally-weighted	1.19	5.17	-23.15	23.31	-0.415	6.45114	0	7902
Product innovation Value-weighted	0.98	4.2	-21.4	14.53	-1.0116	7.25808	0	7902
Resource Reduction Equally-weighted	1.15	5.15	-23.74	20.98	-0.54627	6.22321	0	7504
Resource Reduction Value-weighted	0.95	4.59	-23.4	14.94	-0.86023	7.13007	0	7504
Emission Reduction Equally-weighted	1.19	5.25	-23.18	24.13	-0.35585	6.49035	0	8328
Emission Reduction Value-weighted	0.99	4.67	-21.93	16.92	-0.66034	6.22262	0	8328

Table 11.Descriptive Statistics of the returns of low-rated portfolios (30% cut-off)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for low-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 30% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.	Obs
Environmental Equally-weighted	1.2	5.17	-23.57	19.15	-.63589	5.83867	0	4913
Environmental Value-weighted	0.95	4.44	-23.06	14.11	-1.01705	7.37198	0	4913
Product innovation Equally-weighted	1.31	5.26	-23.54	24.27	-.31159	6.53921	0	5026
Product innovation Value-weighted	1.05	4.26	-21.27	16.77	-.76183	7.18381	0	5026
Resource Reduction Equally-weighted	1.23	5.11	-23.43	18.64	-.70482	5.88334	0	5499
Resource Reduction Value-weighted	0.98	4.42	-22.39	14.2	-1.02735	7.14109	0	5499
Emission Reduction Equally-weighted	1.26	5.16	-23.16	19.24	-.65493	5.74196	0	5486
Emission Reduction Value-weighted	1.04	4.4	-22.12	14.81	-.96378	7.0523	0	5486

Table 12.Descriptive Statistics of the returns of low-rated portfolios (10% cut-off)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for low-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 10% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.	Obs
Environmental Equally-weighted	1.25	5.29	-22.06	14.55	-0.74031	5.25571	0	1845
Environmental Value-weighted	0.97	4.12	-20.08	12.51	-1.08683	6.9256	0	1845
Product innovation Equally-weighted	1.17	5.15	-24.72	18.82	-0.59571	6.14772	0	1874
Product innovation Value-weighted	1.02	4.25	-18.66	14.12	-0.69921	5.54077	0	1874
Resource Reduction Equally-weighted	1.11	5.17	-19.05	18.19	-0.44133	4.91775	0.0004	2057
Resource Reduction Value-weighted	0.99	4.4	-18.29	15.11	-0.64258	5.89338	0	2057
Emission Reduction Equally-weighted	1.15	5.31	-21.71	18.95	-0.59747	5.45289	0	2086
Emission Reduction Value-weighted	1.28	5.64	-20.69	33.82	0.4529	11.19792	0	2086

Table 13.Descriptive Statistics on Portfolio Performance (Long-short Portfolio 50%)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for long-short portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 50% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.
Environmental Equally-weighted	0.12	1.39	-5.23	6.53	0.3364	6.19039	0
Environmental Value-weighted	-0.18	1.87	-12.14	7.06	-0.91148	11.46808	0.0054
Product innovation Equally-weighted	-0.02	1.25	-3.33	5.64	0.17957	4.69202	0.0673
Product innovation Value-weighted	-0.09	1.68	-4.48	7.19	0.5277	5.26173	0.3473
Resource Reduction Equally-weighted	0	1.33	-4.52	4.86	-0.071	3.94431	0
Resource Reduction Value-weighted	-0.05	1.67	-6.2	6.86	0.21076	5.54983	0.0001
Emission Reduction Equally-weighted	-0.04	1.36	-3.84	4.33	-0.12916	3.37607	0.0005
Emission Reduction Value-weighted	-0.08	1.73	-6.99	5.85	-0.45031	5.29236	0.0001

Table 14.Descriptive Statistics on Portfolio Performance (Long-short Portfolio 30%)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for long-short portfolios corresponding to the Difference between going long on High-rated portfolio and Short on a Low-rated portfolios formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 30% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.
Environmental Equally-weighted	-0.08	1.62	-6.55	4.36	-0.40596	4.19594	0.004
Environmental Value-weighted	-0.09	1.83	-5.7	7.35	0.27103	5.50213	0.0707
Product innovation Equally-weighted	-0.18	1.47	-5.16	3.5	-0.31762	3.42946	0.0115
Product innovation Value-weighted	-0.35	2.07	-12.38	5.4	-0.7652	7.99801	0.0778
Resource Reduction Equally-weighted	-0.1	1.43	-5.67	3.4	-0.3134	4.1128	0.0004
Resource Reduction Value-weighted	-0.07	1.75	-7.48	7.14	0.00627	6.05245	0
Emission Reduction Equally-weighted	-0.14	1.68	-5.66	4.72	-0.13587	3.82747	0.0003
Emission Reduction Value-weighted	-0.16	1.81	-6.22	7.3	0.16426	4.74788	0.005

Table 15.Descreptive Statistics on Portfolio Performance (Long-short Portfolio 10%)

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for long-short portfolios corresponding to the difference between going long on High-rated portfolio and Short on a Low-rated formed with a positive screening approach on the Environmental dimension and its three categories (Product Innovation, Resource Reduction and Emission Reduction) and considering a 10% cut-off. Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis, the p-value of the Jarque-Bera test and the number of companies used to compute the portfolios' returns during the period are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.
Environmental Equally-weighted	-0.18	2.34	-7.86	8.01	-0.19959	3.92624	0.0029
Environmental Value-weighted	-0.15	2.14	-8.68	8.15	0.02952	4.89437	0
Product innovation Equally-weighted	-0.03	1.83	-6.12	5.55	-0.28261	3.46448	0.0076
Product innovation Value-weighted	-0.24	2.24	-7.56	5.89	-0.23032	3.3997	0
Resource Reduction Equally-weighted	0	2.12	-6.27	6.61	-0.08965	3.59632	0.03
Resource Reduction Value-weighted	0.18	2.38	-9.07	9.82	0.17499	4.9565	0.0004
Emission Reduction Equally-weighted	0.02	2.66	-7.14	10.22	0.17533	4.45319	0.1813
Emission Reduction Value-weighted	-0.34	3.6	-25.89	11.03	-1.75274	16.25863	0.0001

Table 16.Descriptive Statistics of Risk Factors and Public Information Variables

This table provides descriptive statistics of the monthly returns between 2003 and 2019 for the risk factors (Market risk, SMB – Small minus Big; HML – High minus Low; MOM – Momentum), risk-free rate and public information variables (Dividend Yield and Short-Term Rate). Mean excess returns, standard deviation, maximum and minimum, skewness, kurtosis and the probability value of the Jarque-Bera test are presented.

	Mean (%)	St.Dev (%)	Min (%)	Max (%)	Skewness	kurtosis	JB Prob.
Market Risk	0.817	3.997	-17.23	11.35	-0.73871	4.98339	0.817
SMB	0.139	2.297	-4.76	6.1	0.19529	2.60869	0.139
HML	-0.05	2.489	-11.18	8.29	0.0552	5.45453	-0.05
Risk Free	0.104	0.129	0	0.44	1.2457	3.44276	0.104
MOM	2.065	2.564	0	8.751	1.24977	3.45111	2.065
Dividend Yield	0	54.283	-221.476	102.324	-1.28723	6.46874	0
Short-Term Rate	0	63.192	-252.302	118.823	-1.22462	6.13953	0

5 Empirical Results

This section presents the results on the performance of equally- and value-weighted stock portfolios formed on environmental criteria and using the positive screening strategy. As was mentioned in Chapter 3, to evaluate portfolio performance we apply the conditional version of the four factor model of Carhart (1997) that allows alphas and betas to vary over time (as in Christopherson, Ferson and Glassman, 1998). Each regression applied was tested for heteroskedasticity and autocorrelation of the residuals. In the case of heteroskedasticity) the standard errors can be invalid and induce in type I errors. On the other side, when the residuals present autocorrelation it might also imply erroneous standard errors, also leading to type I errors. To test for autocorrelation we use Breusch (1978)–Godfrey (1978) / LM test. To test for heteroskedasticity we use the Breush-Pagan (1979) and similar to the first term of the Cameron-Trivedi decomposition, the White (1980) test. Thus, in case of heteroskedasticity we apply the White (1980) heteroskedasticity-consistent covariance matrix estimator, and in case of heteroskedasticity and autocorrelation we apply the Newey and West (1994) procedure.

5.1 Performance of high- and low-rated portfolios - positive screening approach (30% cut-off)

We form portfolios for the Environmental Pillar and each of its three categories. Tables 17 and 18 present the regression results of the conditional model applied to high- and low-rated portfolios, respectively, considering a 30% cut-off. Table 19 presents the results of the long-short portfolio, that represents a strategy of going long in a high-rated portfolio and short in the low-rated portfolio. Disregarding the long-short portfolios, the results show that all regressions present an Adjusted R^2 above 92%, which indicates a good fit of the model applied.

According to the results of the $Wald_1$ test, we cannot reject the hypothesis that the conditional alphas of high-rated portfolios are jointly equal to zero. However, the remaining Wald tests support the existence of time-varying betas and time-varying alphas and betas.. Concerning the low-rated portfolios, the coefficients of the $Wald_1$ regarding the ones formed on a value-weighted scheme suggest that alphas are time varying, as there is high probability of rejecting the null hypothesis (at the 1% level). There is also evidence of conditional betas and conditional alphas and betas for every portfolio under evaluation.

Derwall, Guenster, Bauer, and Koedijk, (2005) find positive performance of environmental portfolios constructed on a positive screening basis. We observe that the high-rated portfolio is able to beat the benchmark whenever constructed on a equally-weighted basis. Furthermore, with the exception of portfolio formed on the Product Innovation category, which presents negative performance, all the value-weighted portfolios show neutral performance relative to the benchmark. Halcoussis and Lowenberg (2018) find outperformance of the companies with the best Resource Reduction politics. Yet, we only find this evidence valid when portfolios are formed on a equally-weighted scheme. Our results are not in line with the evidence provided by Derwall, Guenster, Bauer, and Koedijk (2005), who find positive performance of environmentally responsible value-weighted portfolios formed based on the same cut-off but for a different sample period. The same study also shows outperformance of the difference portfolio, whereas we find neutral performance for the difference portfolios of the environmental pillar and the portfolio formed on Resource Reduction criteria, and an underperformance for the remaining. Concerning the low-rated portfolios, the equally-weighted ones perform better than the market, as every portfolio outperforms the benchmark, while portfolios formed on a value-weighted basis show neutral performance (at the 5% level).

The conditional alphas of low-rated portfolios present more exposure to the public information variables. Value-weighted portfolios show a contrasting impact of the public information variables (a negative sign of the dividend yield and a positive sign of the short-term rate), in contrast to the expected effect. The conditional performance of equally-weighted portfolios only shows exposure to the public information variables in the portfolio formed on the product innovation category relative to the dividend yield (negative impact) and in the one formed on the the resource reduction relative to both variables (negative to the dividend yield and positive to the short-term rate).

The betas of the market, all significant at 1%, are very close to 1, though slightly smaller in low-rated and value-weighted portfolios when compared to the high-rated and equally-weighted ones, respectively. This suggests a good diversification of the portfolios constructed on environmental criteria, as documented in previous studies (Kempf and Osthoff, 2007; Derwall, Guenster, Bauer, and Koedijk, 2005). When conditioned by economic information, the coefficients of the market factor of high-rated portfolios show that the ones formed on a value-weighted scheme are negatively and significantly (at level of 1%) affected by increases in the dividend yield, while equally-weighted portfolios show no exposure to the variable. This tendency does not hold for low-rated portfolios, which exhibit insignificant coefficients, except for the Product Innovation and Resource Reduction equally-weighted portfolios, which exhibit a significant relationship (at the 1% and 10% level of significance, respectively). In environments of higher short-term rates, the scenario reverts. High-rated value-weighted portfolios are positively and significantly affected by the short-term rate variable, while equally-weighted portfolios show no significant exposure to this variable. Low-rated portfolios, that previously presented a positive and significant exposure to the dividend yield (in the Product Innovation and Resource Reduction equally-weighted portfolios), now present a negative exposure to the short-term rate variable. Only the Product Innovation difference portfolio shows exposure to the market under the different scenarios, being negatively correlated under times of higher dividend yield and the opposite under times of higher short-term rates.

Previous studies, such as Kempf and Osthoff (2007) and Derwall, Guenster, Bauer, and Koedijk (2006), show that value-weighted portfolios formed on environmental criteria tend to be more exposed to large companies. Our evidence suggests that high-rated companies are exposed to small companies when formed on a equally-weighted scheme and to large companies when formed on a value-weighted scheme. Furthermore, low-rated companies are not only exposed to small companies but are more exposed to small companies that high-rated portfolios, as the negative coefficients of the long-short portfolio confirm. The information variables do not seem to influence the exposition of portfolios to this factor as only one portfolio (high-rated value-weighted portfolio formed on Product Innovation) shows significant exposure to small companies.

Growth companies tend to have very profitable reinvestment opportunities for its own retained earnings, having higher indicators of price to earnings ratio or price to book value, as a result of the higher expectations investors have of receiving higher dividends in the future. If projects making them more environmental friendly are considered efficient and thereby valuable to investors, the portfolios will be more exposed to growth companies, which is only observed by our results when the dividend yield is higher, for the Emission Reduction value-weighted portfolio. Derwall, Guenster, Bauer, and Koedijk (2005) do not find significant exposure of high-rated portfolios to the High-minus-Low risk factor and the exposition of low-rated portfolios to value companies is similar to the results of Kempf and Osthoff (2007), which show exposition to value companies both by high- and low-rated portfolios formed on environmental positive screening criteria. Our results show that high–rated portfolios are exposed to value companies since only two portfolios (Product Innovation and Resource Reduction value-weighted) show insignificant coefficients and the remaining ones present positive significant correlations with the High-minus-Low factor. Low-rated portfolios present lower, although positive coefficients, that are only significant when formed on a equally-weighted scheme. However only the value-weighted portfolio formed on the Emission Reduction criteria shows more exposure of high-rated portfolios to value companies compared to low-rated portfolios, as all the other coefficients concerning this factor in the long-short portfolios are insignificant. With increases in the dividend yield, companies with higher environmental standards show neutral exposure to this factor, while companies with less environmental standards show a high correlation with returns of value companies (except for the value-weighted portfolio formed on the Environmental pillar). On the other hand, when the short-term rate increases, the exposure of the latter shifts towards growth companies (except for the value-weighted portfolio formed on the Environmental pillar), while the former presents neutral exposure.

Our findings on the momentum factor go against the existing evidence provided by the studies previously mentioned in this research, as we observe a negative and significant exposure of all high-rated portfolios to momentum. With exception of the value-weighed portfolios formed on the Product Innovation and Emission Reduction categories, high-rated portfolios are exposed to the returns of loser companies, as previously observed in other studies (Kempf and Osthoff ,2007; Derwall, Guenster, Bauer, and Koedijk, 2005). Similarly, low-rated portfolios also present exposure to loser stocks, with exception of the Emission Reduction value-weighted portfolio. Low-rated portfolios show neutral exposure to this factor contingent on the economic state, similarly to high rated-portfolios, with exception of the Emission Reduction value-weighted portfolio that shows exposure to loser companies in times of higher dividend yield and to winners in times of higher money market yields.

In sum, with only one exception (value-weighted portfolio formed on the Product Innovation category), companies with better environmental standards never underperform the benchmark. They even outperform the benchmark depending on the weighting scheme used to form the portfolio. However, regardless of the category or portfolio weighting scheme, the abnormal returns of low-rated portfolios are similar or higher than those of high-rated portfolios. Only in a scenario of higher dividend yield, some high-rated portfolios are more affected than their low-rated peers, as shown by the corresponding estimates of the long-short portfolios. We observe that the high- and low-rated portfolios show a good diversification level, considering the results on market betas, thus not supporting the hypothesis of Trinks, Scholtens, Mulder and Dam (2018). The public information variables seem to display a higher influence in the performance of low-rated portfolios than in their high-rated peers, which is also observed for the risk factors.

As expected, we find small differences in the results of portfolios formed on the Environmental dimension and its different categories as well as within the categories themselves. Besides the differences in terms of financial performance, the exposure to the risk factors may be also significantly different when comparing portfolios formed with different criteria. The high-rated value-weighted portfolio formed on Product Innovation is the only high-rated portfolio whose performance is conditioned by the economic scenario when compared to the other high-rated portfolios. On the other hand, only companies with low scores in terms of the efficiency of resource use and low product innovation show significant exposure to the market under different economic conditions.

There are also some major differences observed depending on the portfolio construction approach used. Performance seems to be more concentrated in small companies, as equally-weighted portfolios tend to perform better than value-weighted ones. This is consistent with the results of Statman and Glushkov (2009) but inconsistent with the evidence provided by Derwall, Guenster, Bauer, and Koedijk (2005), who find that the results are more dependent on large-cap stocks. Kempf and Osthoff (2007) find no significant differences in performance using the two formation metodologies. Also, we observe that the significance of the risk factors disappears for different weight allocation methodologies. Equally-weighted portfolios are always more exposed to the market, small, value companies and loser companies.

Table 17. Performance of High-rated portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) - positive screening approach (30% cut-off)

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to the 30% high-rated portfolios. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.054***	1.008***	1.070***	0.919***	1.049***	0.993***	1.028***	0.970***
	(0.023)	(0.025)	(0.023)	(0.022)	(0.022)	(0.015)	(0.021)	(0.013)
SMB	0.148***	-0.167***	0.241***	-0.147***	0.174***	-0.237***	0.129***	-0.225***
	(0.032)	(0.031)	(0.036)	(0.035)	(0.031)	(0.024)	(0.031)	(0.023)
HML	0.147***	0.062**	0.113***	0.019	0.134***	0.025	0.144***	0.045**
	(0.040)	(0.030)	(0.037)	(0.040)	(0.038)	(0.019)	(0.038)	(0.019)
MOM	-0.147***	-0.066***	-0.163***	-0.008	-0.147***	-0.023	-0.129***	-0.022
	(0.025)	(0.025)	(0.030)	(0.024)	(0.023)	(0.016)	(0.022)	(0.015)
MKTRF_DY	0.240	-2.162***	0.672	-2.315*	0.299	-1.550***	-0.012	-1.567***
	(0.887)	(0.714)	(0.753)	(1.359)	(0.629)	(0.444)	(0.853)	(0.474)
SMB_DY	-1.688	-0.571	-1.272	2.998*	-2.042	1.061	-1.681	0.640
	(1.875)	(1.431)	(1.590)	(1.660)	(1.674)	(1.090)	(1.552)	(1.222)
HML_DY	-0.309	-1.133	-0.429	-1.068	0.600	-0.236	-0.874	-1.040
	(1.880)	(1.081)	(1.542)	(2.208)	(1.510)	(0.792)	(1.685)	(0.788)
MOM_DY	0.923	-0.646	0.937	-1.777	0.798	-0.698	0.361	-0.987*
	(0.844)	(0.676)	(0.954)	(1.290)	(0.647)	(0.746)	(0.873)	(0.505)
MKTRF_STR	-0.248	1.850***	-0.606	2.021*	-0.275	1.345***	-0.030	1.353***
	(0.750)	(0.618)	(0.637)	(1.149)	(0.535)	(0.383)	(0.719)	(0.408)
SMB_STR	1.473	0.612	1.096	-2.621*	1.720	-0.920	1.482	-0.516
	(1.589)	(1.229)	(1.348)	(1.422)	(1.417)	(0.924)	(1.311)	(1.048)
HML_STR	0.295	0.858	0.388	1.048	-0.503	0.096	0.810	0.811
	(1.555)	(0.893)	(1.269)	(1.799)	(1.248)	(0.637)	(1.391)	(0.640)
MOM_STR	-0.806	0.466	-0.807	1.493	-0.666	0.576	-0.339	0.807*
	(0.722)	(0.586)	(0.795)	(1.102)	(0.557)	(0.646)	(0.759)	(0.429)
DY	-0.017	0.022	-0.061*	-0.054	-0.020	0.008	-0.005	0.003
	(0.035)	(0.026)	(0.033)	(0.043)	(0.033)	(0.017)	(0.034)	(0.021)
STR	0.013	-0.019	0.050*	0.049	0.014	-0.006	0.003	-0.002
	(0.030)	(0.023)	(0.028)	(0.037)	(0.028)	(0.015)	(0.029)	(0.019)
Constant (%)	0.174**	-0.024	0.154**	-0.213***	0.167**	0.025	0.190***	0.021
	(0.075)	(0.065)	(0.076)	(0.071)	(0.068)	(0.048)	(0.070)	(0.046)
$Wald_1$	0.2470	0.7022	0.1281	0.1250	0.1519	0.4480	0.2653	0.8967
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.964	0.955	0.960	0.920	0.969	0.974	0.965	0.973
Observations	204	204	204	204	204	204	204	204

Table 18. Performance of Low-rated portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) - positive screening approach (30% cut-off)

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to the 30% low-rated portfolios. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.991***	0.939***	0.990***	0.921***	0.992***	0.929***	0.992***	0.939***
	(0.033)	(0.034)	(0.033)	(0.029)	(0.024)	(0.028)	(0.028)	(0.025)
SMB	0.493***	0.194***	0.498***	0.123***	0.493***	0.216***	0.511***	0.198***
	(0.052)	(0.047)	(0.048)	(0.039)	(0.036)	(0.051)	(0.042)	(0.038)
HML	0.091**	0.004	0.123**	-0.034	0.079**	0.025	0.069*	-0.059
	(0.036)	(0.037)	(0.047)	(0.049)	(0.037)	(0.037)	(0.038)	(0.039)
MOM	-0.118***	-0.068***	-0.183***	-0.114***	-0.114***	-0.065**	-0.108***	-0.039
	(0.021)	(0.026)	(0.032)	(0.029)	(0.024)	(0.027)	(0.023)	(0.026)
MKTRF_DY	1.528	-0.028	2.400***	1.039	1.729*	-0.103	1.745	0.236
	(1.004)	(1.169)	(0.902)	(1.248)	(0.885)	(0.979)	(1.252)	(0.936)
SMB_DY	-1.308	0.155	-1.131	0.417	-1.763	0.432	-2.582	0.383
	(1.942)	(1.523)	(1.924)	(1.569)	(1.618)	(1.240)	(1.958)	(1.711)
HML_DY	2.977**	1.892	3.506*	3.112**	4.630***	2.432*	4.978***	3.996***
	(1.168)	(1.481)	(1.811)	(1.545)	(1.313)	(1.318)	(1.427)	(1.389)
MOM_DY	-0.967	-1.129	0.354	0.713	0.228	-0.535	0.126	0.366
	(0.896)	(0.858)	(1.548)	(1.227)	(0.861)	(0.860)	(0.822)	(0.910)
MKTRF_STR	-1.338	-0.030	-2.093***	-0.937	-1.498**	0.035	-1.503	-0.243
	0.843)	(0.976)	(0.770)	(1.079)	(0.754)	(0.826)	(1.061)	(0.797)
SMB_STR	1.237	-0.154	1.064	-0.522	1.605	-0.371	2.310	-0.387
	(1.658)	(1.301)	(1.640)	(1.356)	(1.380)	(1.066)	(1.671)	(1.460)
HML_STR	-2.433**	-1.591	-2.794*	-2.588*	-3.851***	-2.027*	-4.161***	-3.395***
	(0.939)	(1.206)	(1.482)	(1.317)	(1.089)	(1.088)	(1.170)	(1.151)
MOM_STR	0.957	1.027	-0.209	-0.620	-0.090	0.518	0.021	-0.213
	(0.787)	(0.744)	(1.346)	(1.064)	(0.742)	(0.759)	(0.704)	(0.784)
DY	-0.049	-0.111***	-0.069*	-0.120***	-0.059*	-0.110***	-0.043	-0.084**
	(0.034)	(0.035)	(0.042)	(0.038)	(0.034)	(0.037)	(0.038)	(0.036)
STR	0.044	0.098***	0.059	0.103***	0.054*	0.099***	0.039	0.076**
	(0.029)	(0.030)	(0.036)	(0.033)	(0.029)	(0.032)	(0.032)	(0.031)
Constant (%)	0.214**	0.040	0.321***	0.160*	0.243***	0.077	0.269***	0.00123
(%)	(0.104)	(0.093)	(0.107)	(0.089)	(0.081)	(0.094)	(0.088)	(0.00085)
$Wald_1$	0.1297	0.0008	0.2528	0.0072	0.0337	0.0009	0.1579	0.0058
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.950	0.928	0.943	0.921	0.957	0.930	0.951	0.935
Observations	204	204	204	204	204	204	204	204

Table 19. Performance of Long-Short portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) - positive screening approach (30% cut-off)

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to the 30% long-short portfolios. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.062**	0.069*	0.080***	-0.002	0.057**	0.064**	0.035	0.031
	(0.030)	(0.039)	(0.029)	(0.038)	(0.025)	(0.031)	(0.027)	(0.032)
SMB	-0.345***	-0.361***	-0.256***	-0.270***	-0.319***	-0.453***	-0.382***	-0.423***
	(0.045)	(0.046)	(0.045)	(0.057)	(0.041)	(0.047)	(0.041)	(0.048)
HML	0.056	0.058	-0.009	0.053	0.055	0.001	0.076	0.105**
	(0.046)	(0.050)	(0.045)	(0.072)	(0.043)	(0.048)	(0.047)	(0.046)
MOM	-0.030	0.003	0.019	0.106**	-0.033	0.043	-0.021	0.017
	(0.030)	(0.039)	(0.030)	(0.045)	(0.026)	(0.032)	(0.029)	(0.036)
MKTRF_DY	-1.288	-2.134	-1.728	-3.354*	-1.429	-1.447	-1.758	-1.803
	(1.105)	(1.401)	(1.093)	(1.984)	(1.083)	(1.155)	(1.402)	(1.535)
SMB_DY	-0.381	-0.726	-0.141	2.582	-0.280	0.628	0.901	0.257
	(2.019)	(1.688)	(1.998)	(2.675)	(1.424)	(2.111)	(1.642)	(1.938)
HML_DY	-3.287**	-3.025	-3.935**	-4.181	-4.030**	-2.668	-5.852**	-5.036***
	(1.639)	(1.900)	(1.622)	(2.874)	(1.975)	(1.713)	(2.259)	(1.879)
MOM_DY	1.890*	0.483	0.584	-2.489	0.570	-0.162	0.235	-1.353
	(1.075)	(1.336)	(1.063)	(2.212)	(0.883)	(1.123)	(1.179)	(1.067)
MKTRF_STR	1.090	1.880	1.487	2.958*	1.223	1.311	1.473	1.596
	(0.940)	(1.186)	(0.931)	(1.687)	(0.912)	(0.983)	(1.173)	(1.310)
SMB_STR	0.236	0.766	0.032	-2.099	0.116	-0.549	-0.827	-0.129
	(1.723)	(1.436)	(1.705)	(2.300)	(1.226)	(1.801)	(1.404)	(1.657)
HML_STR	2.728**	2.449	3.182**	3.636	3.348**	2.123	4.971***	4.206***
	(1.359)	(1.552)	(1.344)	(2.373)	(1.612)	(1.420)	(1.839)	(1.558)
MOM_STR	-1.762*	-0.561	-0.598	2.113	-0.576	0.058	-0.360	1.019
	(0.926)	(1.167)	(0.916)	(1.902)	(0.748)	(0.968)	(1.004)	(0.915)
DY	0.031	0.133***	0.009	0.066	0.040	0.119***	0.037	0.087*
	(0.042)	(0.036)	(0.041)	(0.065)	(0.037)	(0.044)	(0.043)	(0.044)
STR	-0.031	-0.118***	-0.008	-0.054	-0.039	-0.105***	-0.036	-0.078**
	(0.036)	(0.031)	(0.036)	(0.055)	(0.031)	(0.038)	(0.036)	(0.039)
Constant (%)	-0.141	-0.164	-0.267***	-0.473***	-0.176*	-0.152	-0.179**	-0.203**
(%)	(0.101)	(0.112)	(0.100)	(0.124)	(0.099)	(0.105)	(0.091)	(0.100)
$Wald_1$	0.0259	0.0001	0.8478	0.4258	0.0022	0.0055	0.0126	0.0686
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.279	0.301	0.210	0.286	0.352	0.383	0.445	0.403
Observations	204	204	204	204	204	204	204	204

5.2 Robustness Tests

In this section we test whether the results obtained by the baseline model hold under several robustness tests. Particularly, we test two alternative cut-offs to the portfolios: in one we widen the range of companies to 50% and in another we reduced the cut-off level to 10%. Furthermore we form portfolios based on a different screening strategy: the best-in-class approach.

5.2.1 Alternative Cut-offs

Schröder (2014) argues that a more extreme selection based on CSR criteria will result in higher outperformance and since most SRI mutual funds and indexes exhibit only a small difference in company weightings of CSR relative to conventional funds or indexes, the outperformance ends up being null. This motivates the evaluation of portfolio performance using different cut-offs.

Table 20 summarizes results of the conditional alphas obtained with portfolios formed on the three alternative cut-offs and considering a positive screening strategy. Once again we realize the importance of the weighting scheme in forming the portfolios as, overall, performance is sensitive to the use of different capitalization schemes. We do not observe a unique pattern of results from the different cut-offs regarding the long-short portfolios, but in every case, this strategy will lead to neutral or negative performance. The only cases where we can detect similar results is in the case of equally-weighted portfolios formed on the Resource Reduction category criteria, which presents neutral performance when considering the the 50% and 10% cut-offs and underperformance (at 10% level of significance) in the 30% cut-off .

There is only one scenario where going long on environmentally responsible companies can hurt investors' gains, which is the one already mentioned in the previous section: the portfolio formed with 30% best companies concerning Product Innovation. For the remaining cases, we observe that buying environmentally responsible portfolios will not hurt investors' performance regardless of the cut-off or weighting scheme chosen. Investors may even benefit from abnormal ruturns by choosing to go long on environmentally responsible companies if they use an equally-weighted scheme to form the portfolios, since only two equally-weighted portfolios do not provide abnormal returns (the ones based on the Environmental pillar and Product Innovation criteria). If the criteria chosen is Product Innovation and Emission Reduction, we observe robustness of abnormal returns for the three different cut-offs. On the other hand, going long on the least responsible companies might be profitable depending on the cut-off and the screening dimension. Similarly to the case of high-rated portfolios, we observe that equally-weighted portfolios of low rated companies tend to outperform the benchmark. When formed on the Environmental pillar criteria, the portfolios even show robustness of its outperformance across the 3 cut-offs. Finally, and by looking at the estimates provided for each portfolio (Appendix C), we observe that not only the performance but also the risk factors change significantly, as observed in previous studies (e.g., Derwall, Guenster, Bauer, and Koedijk, 2005). As the companies in the high-rated portfolio become more (less) responsible on each screen, they tend to be more exposed to bigger (smaller) cap stocks and decrease its value orientation, as the HML coefficients decrease. Another observation is that low-rated portfolios seem to be more exposed to growth companies in higher cut-offs but shift their exposure to value stocks as the selection becomes more strict, especially for portfolios formed on Resource and Emission reduction, when the screening scores become more extreme and mainly during periods of higher dividend yields.

In sum, our results for different cut-offs do not allow us to claim the robustness of the results of high- and low-rated portfolios. The main differences in results are observed among equally-weighted portfolios, despite some slight differences in the value-weighted ones. Our evidence complies with the inconsistent results for different cut-offs presented by Kempf and Osthoff (2007), who find abnormal returns of the portfolios formed on the 10% cut-off, but not for more broad cut-off levels, using the positive screening strategy and go against the reasoning of Schröder (2014), that states that more extreme cut-offs will be linked to higher outperformance. Other previous studies, such as Derwall, Guenster, Bauer and Koedijk (2005) and Pereira, Cortez and Silva (2019) also try to measure the consistency of the performance of a long-minus-short strategy to alternative cut-off levels. Pereira, Cortez and Silva (2019) do not find changes in performance depending on the various cut-offs applied, while Derwall, Guenster, Bauer and Koedijk (2005) observe that the the risk adjusted outperformance increases as the scope of companies diminishes.

Table 20. Comparison of conditional alphas between alternative cut-offs

This table reports the comparison of conditional alphas (reported in percentage) between alternative cut-offs (50%, 30% and 10%). ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively.

	Value-Weighted				Equally-Weighted			
	Env.	**Prod. Innov.**	**Res. Red.**	**Emiss. Red.**	**Env.**	**Prod. Innov.**	**Res. Red.**	**Emiss. Red.**
High-rated								
50% cut-off	-0.004	0.063	0.006	0.041	0.191***	0.186**	0.227***	0.181**
	(0.044)	(0.061)	(0.042)	(0.045)	(0.066)	(0.072)	(0.076)	(0.076)
30% cut-off	-0.024	-0.213***	0.025	0.021	0.174**	0.154**	0.167**	0.190***
	(0.065)	(0.071)	(0.048)	(0.046)	(0.075)	(0.076)	(0.068)	(0.070)
10% cut-off	-0.024	-0.066	0.200	0.174	0.079	0.142	0.172**	0.328**
	(0.074)	(0.086)	(0.129)	(0.123)	(0.075)	(0.093)	(0.075)	(0.132)
Low-Rated								
50% cut-off	0.149	0.102	0.002	0.015	0.216**	0.209**	0.163	0.199**
	(0.104)	(0.085)	(0.085)	(0.078)	(0.094)	(0.093)	(0.100)	(0.097)
30% cut-off	0.040	0.160*	0.077	0.123	0.214**	0.321***	0.243***	0.269***
	(0.093)	(0.089)	(0.094)	(0.085)	(0.104)	(0.107)	(0.081)	(0.088)
10% cut-off	0.077	0.039	0.111	0.457***	0.255**	0.165	0.066	0.139
	(0.113)	(0.112)	(0.088)	(0.171)	(0.129)	(0.105)	(0.116)	(0.108)
Long-short								
50% cut-off	-0.252**	-0.139	-0.095	-0.074	-0.057	-0.123	-0.036	-0.117
	(0.114)	(0.116)	(0.097)	(0.093)	(0.105)	(0.086)	(0.092)	(0.092)
30% cut-off	-0.164	-0.473***	-0.152	-0.203**	-0.141	-0.267***	-0.176*	-0.179**
	(0.112)	(0.124)	(0.105)	(0.100)	(0.101)	(0.100)	(0.099)	(0.091)
10% cut-off	-0.201	-0.205	-0.011	-0.383*	-0.276*	-0.123	0.006	0.089
	(0.141)	(0.158)	(0.143)	(0.222)	(0.150)	(0.128)	(0.132)	(0.167)

5.2.2 Best-in-class Approach

DiBartolomeo and Kurtz (1999) provide evidence that sector exposures drive SRI portfolio returns to a great extent. By the nature of industries, companies in some industries have lower ESG scores, on average, than companies in other industries (Statman and Glushkov, 2009). Considering these facts, we try to construct industry neutral portfolios by forming portfolios on an alternative screening strategy: the best-in-class and worst–in-class approach, also used in studies such as Derwall, Guenster, Bauer and Koedijk (2005), Kempf and Osthoff (2007) and Pereira, Cortez and Silva (2019).

This section of the robustness tests presents the results of value-weighted and equally-portfolios formed by following a best-in-class strategy. By following this approach, each portfolio is formed by the 30% companies with best screening score of each of the 11 industries considered (following the Industry Classification Benchmark system). Tables 21, 22 and 23 present the regression results of the best and worst-in-class portfolios, as well as the best-minus-worst portfolios constructed on the basis of the Environmental Pillar and each of its categories. As before, portfolio performance is evaluated by means of the conditional multi-factor model with time-varying alphas and betas.

Best- and worst-in-class portfolios show high adjusted R^2, ranging between 0.923 and 0.981, which seems a good fit of the conditional model applied. When the industry biases disappear, we observe that the performance of the equally-weighted portfolios of the best companies decreases and even disappears for the ones formed on Environmental Pillar and Emission Reduction category. On the other hand, value-weighted portfolios never underperform the benchmark. The portfolio formed by companies with the worst conducts in each industry presents outperformance in every criterion when formed on equally-weighted basis and neutral performance or outperformance in the case of the one formed on the Emission Reduction criteria when the basis of formation changes to value-weighted. The best-minus-worst portfolio provides evidence that portfolios with companies with worst conducts perform significantly better when there are no industry biases, except for the value-weighted portfolio formed on Emission Reduction criteria, which does not show significant negative alpha coefficients.

The effect of public information on the alphas remains similar to the portfolios formed on positive screening strategy, as the results on the Wald tests do not allow us to reject the hypothesis of the joint variation of the conditional alphas.

When we analyze portfolios with the 30% companies with the best conducts in each industry, we observe that the investment style shows small changes when compared with portfolios that do not consider the industry factor. In general, there are no big differences in the majority of the portfolios but still there are some observations worth to be made. We observe no significant differences in the market exposure since the coefficients remain closed to 1 as previously observed in section 5.1. We only detect one significant difference regarding the small minus big factor concerning the Emission Reduction value-weighted portfolio that changes its exposure to small companies. Without industry biases, portfolios are regularly exposed to value and loser companies. When using the best-in-class approach, we observe neutral exposures in some cases. When conditioned by economic information, there are notable differences between the best-in-class portfolios and high-rated portfolios formed on the positive screening approach. The Emission Reduction value-weighted portfolio changes its exposure in all the risk factors. Furthermore, we observe that the equally-weighted portfolios constructed on the Product Innovation and Emission Reduction categories change their exposure on the high-minus-low and momentum factors and, in the case of the later, the small-minus-big factor. Finally, we observe that value-weighted portfolio constructed on Product Innovation criteria also change its exposure concerning the small-minus-big factor.

By comparing the worst-in-class and low-rated portfolios (with no consideration for the industry) we observe minor changes both in performance and investment style. Concerning performance, we note that only the value-weighted portfolio formed on Product Innovation criteria does not maintain its outperformance. Thus, only equally-weighted portfolios outperform, despite the fall of 0,1% in the performance of the Product Innovation and Emission Reduction equally-weighted portfolios. With exception of the Product Innovation value-weighted portfolio, the performance of all other value-weighted portfolios remains negatively conditioned by increases in the dividend yield, while the alphas of equally-weighted portfolios show no exposure to the public information variables. In general, the portfolios do not change their exposure to the risk factors, with some exceptions. With worst-in-class portfolios, we observe some exposure to growth companies by value-weighted portfolios formed on the Environmental and Emission Reduction criteria. When conditioned on the information variables, worst-in-class portfolios seem to be more exposed to the market factor, showing positive coefficients with increases in the dividend yield and negative ones with increases in the short-term rate. The opposite is observed with the high-minus-low factor, which shows less exposure to value companies with increases in the dividend yield and to growth companies with increases in the short-term rate.

In sum, our results are not robust for every portfolio when we take out industry biases. The results provided concerning the best-in-class and worst-in-class strategies suggest higher market efficiency than the results concerning the positive screening strategy. Anyhow, there are significant similarities between the two approaches. We note that if value-driven investors use a best-in-class approach to form SRI portfolios, they will probably achieve neutral or even outperformance depending on the criteria used. Kempf and Osthoff (2007) and Derwall, Guenster, Bauer and Koedijk (2005) find it is possible to achieve abnormal returns by going long on best-in-class portfolios and short in their worst-in-class peers, while Halbritter and Dorfleitner (2015) and Pereira, Cortez, and Silva, (2018) find that such strategy leads to neutral performance. We provide new evidence as we observe that applying such strategy would lead to negative performance since worst-in-class portfolios formed on environmental criteria perform better. Apparently, industry biases seem to increase the outperformance of the more responsible portfolios. Finally, best-in-class portfolios seem to be more consistent in their style concerning the risk factors when compared to high-rated portfolios analyzed in section 5.1.

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Table 21. Performance of best-in-class portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) – Best-in-class screening approach (30% cut-off)

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to the 30% best-in-class portfolios. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.071***	0.995***	1.069***	0.976***	1.066***	0.979***	1.069***	1.018***
	(0.021)	(0.011)	(0.022)	(0.013)	(0.021)	(0.020)	(0.019)	(0.026)
SMB	0.198***	-0.196***	0.240***	-0.167***	0.217***	-0.141***	0.211***	0.482***
	(0.031)	(0.020)	(0.032)	(0.024)	(0.032)	(0.029)	(0.029)	(0.045)
HML	0.129***	0.046**	0.128***	0.077***	0.153***	0.054**	0.123***	0.079***
	(0.034)	(0.018)	(0.028)	(0.020)	(0.036)	(0.022)	(0.028)	(0.029)
MOM	-0.148***	-0.039***	-0.140***	-0.029*	-0.145***	-0.054***	-0.149***	-0.148***
	(0.018)	(0.013)	(0.023)	(0.016)	(0.023)	(0.020)	(0.020)	(0.024)
MKTRF_DY	0.191	-1.614***	0.879	-1.641***	0.645	-1.472***	-0.192	2.052***
	(0.785)	(0.386)	(0.785)	(0.514)	(0.771)	(0.439)	(0.776)	(0.584)
SMB_DY	-2.573	1.106	-2.015	-0.014	-2.035	1.268	-2.621*	-2.840*
	(1.626)	(1.099)	(1.632)	(1.381)	(1.984)	(1.281)	(1.402)	(1.510)
HML_DY	0.397	-0.484	2.874**	-0.529	1.187	-0.472	0.915	2.154**
	(1.353)	(0.676)	(1.339)	(0.789)	(1.452)	(0.822)	(1.215)	(1.064)
MOM_DY	0.812	-0.465	1.805**	-0.623	1.712**	-0.333	0.213	0.842
	(0.835)	(0.451)	(0.829)	(0.584)	(0.787)	(0.530)	(0.805)	(0.970)
MKTRF_STR	-0.187	1.373***	-0.755	1.418***	-0.577	1.253***	0.149	-1.796***
	(0.664)	(0.333)	(0.658)	(0.443)	(0.654)	(0.373)	(0.661)	(0.505)
SMB_STR	2.119	-0.922	1.700	0.027	1.748	-1.041	2.136*	2.501*
	(1.377)	(0.940)	(1.390)	(1.184)	(1.694)	(1.098)	(1.182)	(1.284)
HML_STR	-0.340	0.326	-2.372**	0.348	-0.995	0.316	-0.825	-1.680*
	(1.130)	(0.553)	(1.095)	(0.653)	(1.211)	(0.670)	(1.009)	(0.874)
MOM_STR	-0.688	0.346	-1.478**	0.518	-1.441**	0.223	-0.109	-0.648
	(0.736)	(0.385)	(0.700)	(0.502)	(0.675)	(0.451)	(0.697)	(0.832)
DY	-0.018	-0.001	-0.055*	-0.003	-0.029	-0.003	-0.017	-0.064*
	(0.031)	(0.020)	(0.033)	(0.028)	(0.036)	(0.025)	(0.029)	(0.034)
STR	0.014	0.001	0.046	0.004	0.022	0.004	0.013	0.055*
	(0.026)	(0.018)	(0.028)	(0.024)	(0.031)	(0.022)	(0.025)	(0.029)
Constant (%)	0.082	-0.024	0.136**	-0.030	0.118*	0.002	0.091	0.209**
(%)	(0.069)	(0.043)	(0.063)	(0.048)	(0.065)	(0.058)	(0.061)	(0.081)
$Wald_1$	0.5921	0.9359	0.1643	0.4286	0.2867	0.4782	0.5193	0.1633
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.977	0.980	0.971	0.974	0.974	0.967	0.974	0.967
Observations	204	204	204	204	204	204	204	204

Table 22. Performance of worst-in-class portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) – Worst-in-class screening approach (30% cut-off)

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to the 30% worst-in-class portfolios. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.002***	0.938***	1.009***	0.971***	1.027***	0.993***	1.010***	0.980***
	(0.030)	(0.031)	(0.026)	(0.024)	(0.021)	(0.025)	(0.027)	(0.023)
SMB	0.490***	0.231***	0.456***	0.049	0.390***	0.117**	0.487***	0.123***
	(0.052)	(0.049)	(0.045)	(0.033)	(0.038)	(0.057)	(0.047)	(0.038)
HML	0.057*	-0.063*	0.080***	-0.048	0.084**	-0.007	0.085***	-0.085***
	(0.033)	(0.036)	(0.027)	(0.032)	(0.033)	(0.040)	(0.028)	(0.026)
MOM	-0.124***	-0.099**	-0.158***	-0.059*	-0.156***	-0.018	-0.142***	-0.058**
	(0.022)	(0.039)	(0.024)	(0.034)	(0.022)	(0.037)	(0.023)	(0.024)
MKTRF_DY	0.216	0.715	2.536***	1.211*	2.225***	-0.548	1.068**	1.178**
	(0.993)	(1.225)	(0.625)	(0.711)	(0.620)	(1.046)	(0.501)	(0.503)
SMB_DY	-1.440	-1.561	-3.187**	-0.847	-2.038	-0.534	-2.470*	-0.307
	(1.813)	(2.042)	(1.399)	(1.031)	(1.476)	(1.712)	(1.281)	(0.901)
HML_DY	0.524	1.838	2.257**	1.384	3.139***	1.140	2.198**	1.360
	(1.085)	(1.582)	(0.932)	(1.026)	(1.063)	(1.094)	(1.006)	(0.871)
MOM_DY	-0.029	0.899	1.035	0.788	1.005	-1.508	-0.234	0.190
	(0.972)	(1.513)	(1.065)	(0.874)	(0.979)	(1.295)	(0.689)	(0.617)
MKTRF_STR	-0.251	-0.683	-2.224***	-1.160*	-1.938***	0.497	-0.932**	-1.052**
	(0.842)	(1.048)	(0.542)	(0.608)	(0.537)	(0.920)	(0.428)	(0.430)
SMB_STR	1.373	1.388	2.807**	0.617	1.747	0.420	2.143**	0.222
	(1.549)	(1.741)	(1.194)	(0.887)	(1.249)	(1.534)	(1.084)	(0.785)
HML_STR	-0.347	-1.558	-1.753**	-1.029	-2.460***	-0.873	-1.759**	-1.102
	(0.892)	(1.327)	(0.768)	(0.859)	(0.886)	(0.897)	(0.822)	(0.720)
MOM_STR	0.082	-0.737	-0.829	-0.697	-0.788	1.396	0.331	-0.162
	(0.850)	(1.298)	(0.929)	(0.755)	(0.846)	(1.146)	(0.580)	(0.541)
DY	-0.050	-0.097**	-0.041	-0.028	-0.085**	-0.203***	-0.053*	-0.089***
	(0.039)	(0.045)	(0.033)	(0.033)	(0.033)	(0.064)	(0.031)	(0.030)
STR	0.045	0.083**	0.035	0.024	0.073**	0.177***	0.046*	0.078***
	(0.033)	(0.039)	(0.028)	(0.028)	(0.028)	(0.056)	(0.027)	(0.026)
Constant (%)	0.241**	0.148	0.226***	0.074	0.177**	0.121	0.197**	0.048
(%)	(0.100)	(0.091)	(0.082)	(0.066)	(0.072)	(0.085)	(0.079)	(0.061)
$Wald_1$	0.1313	0.1015	0.4621	0.6591	0.0349	0.0055	0.1846	0.0052
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.955	0.927	0.967	0.950	0.969	0.923	0.969	0.966
Observations	204	204	204	204	204	204	204	204

Table 23. Performance of Environmental and Environmental Categories using Best Minus Worst Approach

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to the 30% best-minus-worst portfolios. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.069***	0.057*	0.060***	0.005	0.039***	-0.014	0.059***	0.038***
	(0.020)	(0.032)	(0.018)	(0.032)	(0.013)	(0.040)	(0.013)	(0.014)
SMB	-0.292***	-0.426***	-0.216***	-0.216***	-0.173***	-0.258***	-0.276***	0.359***
	(0.031)	(0.055)	(0.028)	(0.046)	(0.027)	(0.072)	(0.028)	(0.026)
HML	0.072**	0.108**	0.047*	0.125***	0.070***	0.061	0.039	0.164***
	(0.031)	(0.043)	(0.028)	(0.036)	(0.019)	(0.047)	(0.028)	(0.023)
MOM	-0.025	0.060	0.018	0.030	0.011	-0.036	-0.007	-0.090***
	(0.021)	(0.042)	(0.017)	(0.041)	(0.013)	(0.045)	(0.018)	(0.020)
MKTRF_DY	-0.025	-2.328	-1.657**	-2.852***	-1.579***	-0.924	-1.261*	0.874
	(0.753)	(1.411)	(0.732)	(1.038)	(0.443)	(1.067)	(0.674)	(0.584)
SMB_DY	-1.133	2.667	1.171	0.833	0.003	1.801	-0.151	-2.534**
	(1.375)	(2.605)	(1.307)	(1.711)	(0.979)	(1.539)	(1.146)	(1.170)
HML_DY	-0.127	-2.323	0.617	-1.913	-1.952***	-1.612	-1.283	0.794
	(1.116)	(1.882)	(1.150)	(1.302)	(0.707)	(1.438)	(1.287)	(0.856)
MOM_DY	0.840	-1.364	0.770	-1.412	0.707*	1.175	0.447	0.652
	(0.732)	(1.702)	(0.734)	(1.243)	(0.417)	(1.601)	(0.868)	(0.681)
MKTRF_STR	0.065	2.056*	1.469**	2.578***	1.361***	0.756	1.081*	-0.744
	(0.641)	(1.210)	(0.624)	(0.886)	(0.378)	(0.925)	(0.566)	(0.496)
SMB_STR	0.745	-2.310	-1.108	-0.590	0.002	-1.461	-0.007	2.279**
	(1.174)	(2.228)	(1.109)	(1.462)	(0.838)	(1.379)	(0.964)	(0.996)
HML_STR	0.007	1.884	-0.620	1.376	1.465**	1.189	0.934	-0.577
	(0.925)	(1.578)	(0.953)	(1.083)	(0.579)	(1.170)	(1.054)	(0.702)
MOM_STR	-0.770	1.083	-0.649	1.215	-0.653*	-1.173	-0.439	-0.486
	(0.631)	(1.460)	(0.635)	(1.088)	(0.359)	(1.411)	(0.741)	(0.581)
DY	0.032	0.095*	-0.014	0.025	0.057***	0.200***	0.036	0.026
	(0.029)	(0.055)	(0.029)	(0.045)	(0.021)	(0.061)	(0.025)	(0.025)
STR	-0.031	-0.082*	0.011	-0.020	-0.051***	-0.173***	-0.033	-0.023
	(0.025)	(0.047)	(0.025)	(0.039)	(0.019)	(0.053)	(0.021)	(0.022)
Constant (%)	-0.260***	-0.272***	-0.190***	-0.204**	-0.158***	-0.219**	-0.206***	0.061
(%)	(0.069)	(0.102)	(0.060)	(0.084)	(0.047)	(0.095)	(0.053)	(0.053)
$Wald_1$	0.0106	0.2247	0.6027	0.5475	0.0014	0.0045	0.0378	0.3152
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.404	0.365	0.307	0.260	0.407	0.241	0.451	0.756
Observations	204	204	204	204	204	204	204	204

5.3. Evolution of environmental and financial performance over time

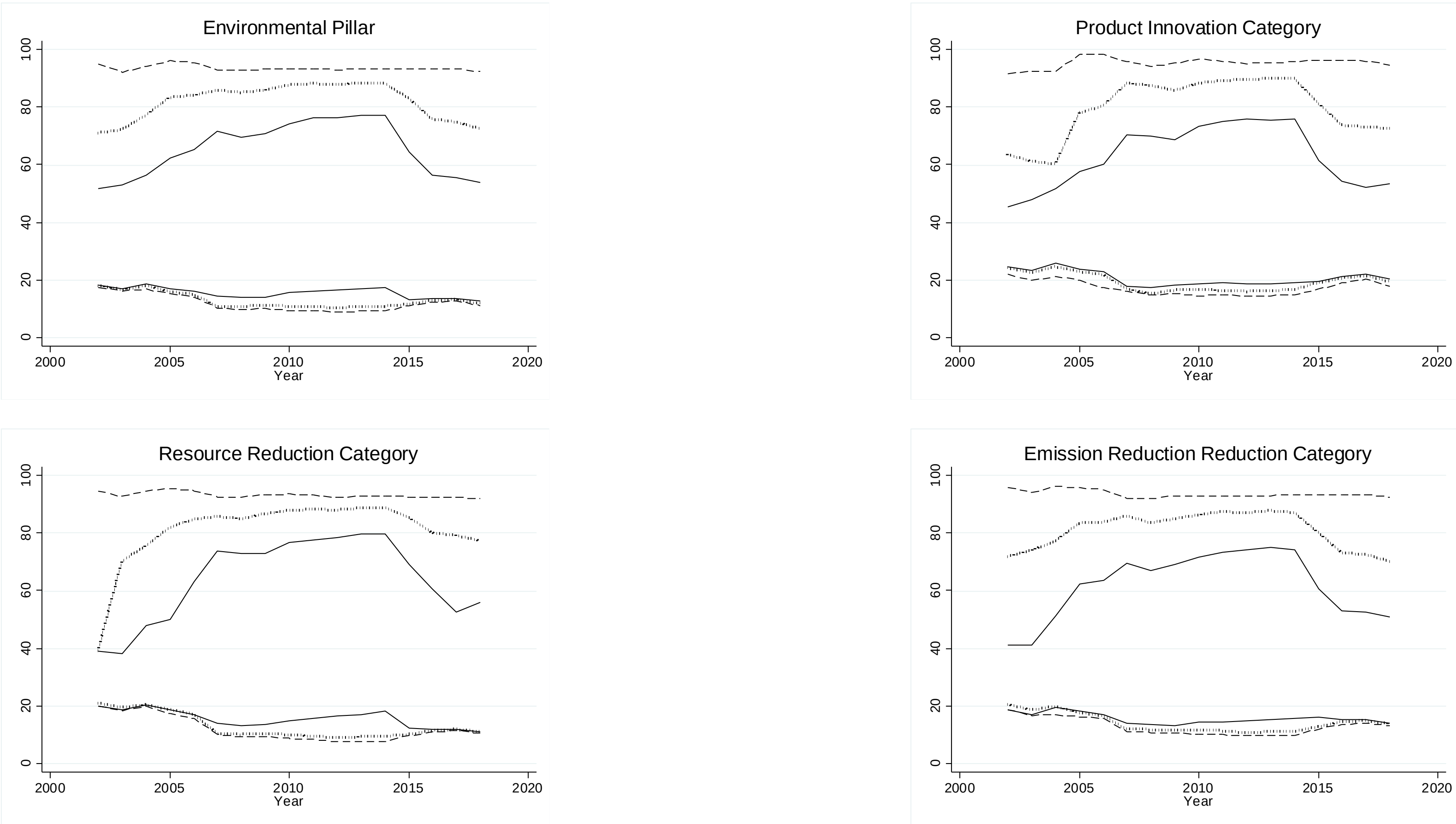
In this section we analyze the evolution of portfolios'environmental scores over time. Environmental Portfolios are constructed using the positive screening approach and splitting the period into three different sub-periods of about equal length.

5.3.1. Evolution of environmental performance

Figure 1 presents the evolution the environmental scores of high and low-rated portfolios formed on the Environmental Pillar and each of its three categories basis, considering different cut-offs (50%, 30% and 10%). High-rated portfolios with 30% and 50% cut-offs show a similar pattern of evolution. The former exhibit an increase of environmental scores until 2007/2008, which then stabilizes, and even decreases in the case of Product Innovation portfolios, reflecting the effects associated to the financial crisis. Afterwards, the scores slowly grow until 2014, after which they rapidly decrease to the levels of the beginning of 2018. The evolution of the scores of the low-rated portfolios show a low and consistent level around the 20s, despite a slightly decrease in the overall mean score over time.

Figure 1. Scores Over Time

For each month between 2003 and 2018, the upper (lower) half of each graph in this figure shows the mean ESG scores of portfolios containing the high-rated (low-rated) firms. Portfolios with 50%, 30% and 10% cut-off rates are represented by indicated by the solid, dot and dash lines respectively, respectively.



5.3.2. Performance over different Sub Periods

Pereira, Cortez, and Silva (2019) realize that the performance of a strategy of going long on environmentally responsible companies and short on companies with lower environmental standards decreases from a scenario of abnormal returns between 2003-2010 to a neutral performance from 2010 until 2016. The authors state that those results are consistent with the hypothesis of decreasing abnormal returns over time of SRI portfolios, in line with with the errors-in-expectations hypothesis of Derwall, Koedijk, and Horst (2011), that argue that mispriced securities become correctly valued or even overvalued as the investors perceive and learn how to assess value-relevant information associated to corporate social responsibility. Kempf and Osthoff (2007) divide the sample in two equal periods and also analyze the evolution of performance of a long-short SRI strategy over the years. The authors find that in neither sub-periods portfolios formed on environmental criteria are able to outperform the benchmark.

Therefore, in this section we divide the overall period into subperiods in order to assess the evolution of portfolio performance over time. The conditional alphas of high, low and long-short portfolios for the 50%, 30% and 10% cut-offs for the subperiods 2003-2007, 2008-2013 and 2014-2019 are presented in tables 24 and 25. We observe notable differences between the results of equally-weighted and value-weighted portfolios. Considering the long-short value-weighted portfolios,we observe a general neutral performance for the different sub-periods. In general, the estimates are not robust to the 3 cut-offs applied. In any case, portfolios formed on the Resource Reduction criteria and considering a 10% cut-off between 2003 and 2007 were able to beat the benchmark, although performance rebounds to neutral performance in the following sub-period. Our evidence on value-weighted portfolios is in line with the results of previous studies that find that going long on environmentally responsible portfolios and shortening the less responsible would lead to neutral performance (Derwall, Bauer, Guenster, and Koedijk, 2005; Pereira, Cortez, and Silva, 2019) or outperformance. We also note that the value-weighted high-rated portfolios formed on Envionmental pillar criteria have consistent neutral performance in the three subperiods, while portfolios constructed on the remaining criteria show decreasingly or consistent neutral performance, with the exception of the Product Innovation portfolio with a 50% cut-off and the Emission Reduction portfolio with a 10% cut-off, that increase their performance from the first to the last sub-period. Low-rated portfolios formed on value-weighted scheme present similar results to high-rated portfolios. Forming portfolios based on the Environmental pillar criteria does not seem to lead to abnormal returns in any case, and there is no portfolio with consistent outperformance or underperformance. In general portfolios seem to be decreasing their performance during the the sub-periods.

Considering equally-weighted portfolios, going long on high-rated companies and short on less responsible companies does not lead to performance differentials compared to low-rated companies. To some extent, this strategy will lead to underperformance in every criteria chosen with some cut-offs as exception. The reason is the more impacted decrease observed in the performance of high-rated portfolios when compared to the decrease in the performance of low-rated portofolios over the three sub-periods. Between 2014 and 2019, the underperformance of the long-short strategy is more frequent, as only two portfolios do not underperform. In any case, there is little evidence of underperformance of high-rated portfolios relative to the benchmark We only find one portfolio with underperformace during the different sub-periods, the 50% cut-off formed on Product Innovation criteria, which might be good news to the value-driven investor. It is important to note that the first sub-period is marked by the superior adjusted returns of more responsible companies and less responsible ones, which disappears in the remaining sub-periods. The market seems to react fairly efficient by adjusting the mispricing over time. This evidence is consistent with the errors-in-expectations hypothesis and the results and Pereira, Silva and Cortez (2019), who find that any outperformance of high-ranked and low-ranked companies disappears after 2007. Lastly, we highlight that regardless of the construction approach, the cut-off or the time period considered, low-rated portfolios never underperform.

We also study the evolution of the investment style of the portfolios during the different time periods. To do so, we analyze the estimates of the four-factor model (Carhart, 1997) conditioned on public information, similarly to sections 5.1 and 5.2. Again, similarly to the two previous sections, we consider the 30% cut-off as our main analysis. In any case, we provide the estimates for other cut-offs and for the high- and low-rated portfolios in appendix D. Tables 26, 27 and 28 present the regression results of the conditional model applied to long-short portfolios formed with a 30% cut-off , for the subperiods 2003 and 2007, 2008 and 2013 and 2014 and 2019.

The long-short portfolios evaluated in this study show that the portfolios' exposure to the market is similar, regardless of the percentile used to cut the samples. The only case that the long-short portfolio presents negative coefficents considering the market risk factor is in the 2014 to 2019 sub-period for the 10% portfolios formed on the Emission Reduction criteria, due to the unregularly low market beta of high-rated portfolios for the same cut-off and sub-period. Both high- and low- rated companies present values of systematic risk close to 1 (Appendix D), which represents a very close correlation with the market. The values are generally stable and significant, which means that this tendency holds during the three time windows. The exposure to SMB by the long-short portfolios decreases over the three sub-periods, due to the tendency over the three sub-periods of high-rated (low-rated) portfolios being more exposed to the returns of companies with larger (lower) size. Between 2014 and 2019, low-rated companies seem to be even more exposed to small companies when the short-term rate is higher. Concerning the HML factor, we observe that the previous tendency observed in section 5.1 is consistent in the three sub-periods. In general, both portfolios show neutral exposure to both growth and value companies. However, after observing the results on the performance of the 10% cut-off portfolios in all sub-periods (Appendix D), we notice that high-rated portfolios shift the exposure from growth to value companies during the three subperiods, while low-rated portfolios increase their exposure to the later. The evolution of the portfolios' exposure to the momentum factor does not seem so consistent among subperiods, as long-short portfolios start by showing insignificant coefficients in the first subperiods, to neutral and positive coefficients in the second sub-period, implying a higher exposure of low-rated companies to losers, and finally this reverts to negative coefficients, reflecting the exposure of high-rated portfolios to losers. The negative coefficients concerning this risk factor implies that high-rated portfolios might be subjecto lower returns during higher rates in the money markets.

Bauer, Derwall, and Otten (2007) find that ethical portfolios are more value oriented and present more exposure to winner companies. The long-short portfolios evaluated in this study show mix exposure to value and growth companies in the first two subsets of sample period, but the last sub-period shows the exposure to value oriented companies. Galema, Plantinga, and Scholtens (2008) find that high-rated companies are increasingly exposed to growth companies as times goes by, whereas our study find the opposite tendency for the majority of the portfolios under evaluation, as portfolios become more more value-oriented. The momentum factor is highly variable for the sub-periods analyzed.

Table 24. Alphas of the portfolios formed on the Environmental pillar and the Resource Reduction, Emission Reduction, and Product Innovation categories for different sub-periods - positive screening approach and value-weighted portfolios

This table summarizes the monthly abnormal returns (reported as percentage) using the conditional version of Carhart (1997) four-factor model for portfolios formed on the Environmental pillar and the Resource Reduction (RR), Emission Reduction (ER), and Product Innovation (PI) categories for different sub-periods, considering a positive screening approach. The portfolios span the period of 2003 to 2007, 2008 to 2013 and 2014 to 2019. The portfolios are value-weighted. ***, **, and * indicate significance at the 1%, 5%, and 10% level Standard errors are inside parenthesis. Standard errors are computed using the Newey-West (1987) method, the White (1980) variance–covariance matrix, or the Breusch-Pagan test whenever necessary

		2003-2007			**2008-2013**			**2014-2019**		
		High-Rated	Low-Rated	High-Low	High-Rated	Low-Rated	High-Low	High-Rated	Low-Rated	High-Low
Env	50 % Cut-Off	0.170	0.218	-0147	-0.042	0.102	-0.244	-0.066	0.040	-0.207
		(0.101)	(0.167)	(0.232)	(0.054)	(0.133)	(0.164)	(0.073)	(0.121)	(0.152)
	30 % Cut-Off	0.188	0.257	-0.169	-0.029	0.001	-0.181	-0.158	-0.008	-0.250
		(0.158)	(0.225)	(0.296)	(0.074)	(0.001)	(0.181)	(0.109)	(0.130)	(0.187)
	10 % Cut-Off	0.075	0.255	-0.280	-0.079	0.139	-0.318	0.092	0.129	-0.136
		(0.184)	(0.280)	(0.392)	(0.120)	(0.246)	(0.249)	(0.120)	(0.174)	(0.250)
PI	50 % Cut-Off	0.180	0.073	0.007	-0.052	0.095	-0.246	0.296**	0.014	0.182
		(0.109)	(0.175)	(0.254)	(0.058)	(0.169)	(0.190)	(0.122)	(0.108)	(0.172)
	30 % Cut-Off	0.303**	0.316	-0.113	-0.281**	0.189*	-0.569***	-0.218*	-0.010	-0.308
		(0.141)	(0.268)	(0.295)	(0.128)	(0.106)	(0.161)	(0.109)	(0.159)	(0.233)
	10 % Cut-Off	0.039	0.571*	-0.632	-0.135	-0.189	-0.047	-0.036	-0.102	-0.034
		(0.184)	(0.336)	(0.432)	(0.119)	(0.207)	(0.288)	(0.108)	(0.124)	(0.187)
RR	50 % Cut-Off	0.154*	0.276	-0.221	-0.049	-0.046	-0.103	0.016	-0.005	-0.079
		(0.084)	(0.275)	(0.333)	(0.063)	(0.131)	(0.162)	(0.038)	(0.119)	(0.126)
	30 % Cut-Off	0.106	0.354*	-0.348	0.009	0.031	-0.122	0.028	0.162	-0.234
		(0.148)	(0.188)	(0.261)	(0.077)	(0.129)	(0.186)	(0.058)	(0.135)	(0.179)
	10 % Cut-Off	0.826***	0.003	0.723*	0.356	0.264	-0.008	-0.142	0.124	-0.366
		(0.265)	(0.254)	(0.378)	(0.234)	(0.211)	(0.291)	(0.232)	(0.114)	(0.255)
ER	50 % Cut-Off	0.277**	0.224	-0.048	-0.039	0.024	-0.164	-0.033	-0.013	-0.120
		(0.125)	(0.267)	(0.341)	(0.051)	(0.112)	(0.144)	(0.070)	(0.109)	(0.128)
	30 % Cut-Off	0.123	0.363*	-0.340	-0.035	0.102	-0.237	0.027	0.145	-0.218
		(0.141)	(0.202)	(0.304)	(0.079)	(0.127)	(0.178)	(0.046)	(0.144)	(0.169)
	10 % Cut-Off	0.070	0.139	-0.170	-0.025	0.749**	-0.874**	0.590*	0.214	0.276
		(0.236)	(0.267)	(0.423)	(0.151)	(0.358)	(0.345)	(0.302)	(0.146)	(0.341)

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Table 25. Alphas of the portfolios formed on the Environmental pillar and the Resource Reduction, Emission Reduction, and Product Innovation categories for different sub-periods - positive screening approach and equally-weighted portfolios

This table summarizes the monthly abnormal returns (reported as percentage) using the conditional version of Carhart four-factor model for portfolios constructed based on positive screening in different sub-periods. The portfolios span the period of 2003 to 2007, 2008 to 2013 and 2014 to 2019. The portfolios are equally-weighted. ∗∗∗, ∗∗, and ∗ indicate significance at the 1%, 5%, and 10% level. Standard errors are inside parenthesis. Standard errors are computed using the Newey-West (1987) method, the White (1980) variance–covariance matrix, or the Breusch-Pagan test whenever necessary. The first column's letters Env, PI, RR, ER are acronyms representing Environment, Product Innovation, Resource Reduction, Emission Reduction

		2003-2007			**2008-2013**			**2014-2019**		
		High-Rated	Low-Rated	High-Low	High-Rated	Low-Rated	High-Low	High-Rated	Low-Rated	High-Low
Env	50 % Cut-Off	0.584*** (0.135)	0.626*** (0.136)	0.267 (0.294)	0.064 (0.100)	0.129 (0.094)	-0.139 (0.129)	-0.103 (0.091)	0.091 (0.113)	-0.244* (0.142)
	30 % Cut-Off	0.439*** (0.135)	0.543*** (0.180)	-0.204 (0.200)	0.054 (0.094)	0.233* (0.121)	-0.278** (0.116)	-0.117 (0.091)	0.139 (0.136)	-0.357** (0.166)
	10 % Cut-Off	0.588*** (0.129)	0.585** (0.284)	-0.096 (0.325)	-0.085 (0.108)	0.394* (0.216)	-0.579** (0.232)	-0.087 (0.120)	0.289 (0.188)	-0.476* (0.241)
PI	50 % Cut-Off	0.667*** (0.144)	0.465*** (0.171)	0.102 (0.247)	0.068 (0.106)	0.155 (0.00121)	-0.187* (0.095)	-0.069 (0.095)	0.056 (0.105)	-0.225* (0.125)
	30 % Cut-Off	0.592*** (0.130)	0.658*** (0.204)	-0.166 (0.231)	-0.030 (0.123)	0.302*** (0.092)	-0.432*** (0.114)	-0.122 (0.101)	0.114 (0.140)	-0.336* (0.170)
	10 % Cut-Off	0.634*** (0.166)	0.830*** (0.267)	-0.296 (0.345)	-0.011 (0.129)	0.143 (0.183)	-0.254 (0.222)	-0.061 (0.131)	-0.176 (0.123)	0.015 (0.161)
RR	50 % Cut-Off	0.579*** (0.126)	0.551** (0.218)	-0.072 (0.281)	0.078 (0.109)	0.101 (0.115)	-0.123 (0.088)	-0.072 (0.091)	0.096 (0.113)	-0.268** (0.127)
	30 % Cut-Off	0.430*** (0.150)	0.728*** (0.143)	-0.398** (0.171)	0.141 (0.087)	0.334* (0.198)	-0.171 (0.120)	-0.146 (0.100)	0.184 (0.131)	-0.429*** (0.146)
	10 % Cut-Off	0.694*** (0.155)	0.111 (0.280)	0.483 (0.318)	0.048 (0.116)	0.334* (0.198)	-0.386** (0.171)	-0.001 (0.123)	0.251* (0.148)	-0.352* (0.180)
ER	50 % Cut-Off	0.552*** (0.127)	0.546** (0.220)	-0.095 (0.287)	0.067 (0.099)	0.141 (0.124)	-0.173* (0.090)	-0.143 (0.091)	0.123 (0.105)	-0.365*** (0.113)
	30 % Cut-Off	0.463*** (0.135)	0.746*** (0.166)	-0.383* (0.202)	0.055 (0.103)	0.250** (0.121)	-0.295** (0.143)	-0.059 (0.094)	0.179 (0.135)	-0.338** (0.153)
	10 % Cut-Off	0.567*** (0.157)	0.305 (0.248)	0.162 (0.359)	-0.032 (0.125)	0.377* (0.219)	-0.508** (0.229)	0.570* (0.322)	0.196 (0.152)	0.274 (0.301)

Table 26. Performance of Long-Short portfolios - 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% long-short portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	-0.006	-0.007	-0.035	-0.169	0.060	0.137	0.064	0.108
	(0.084)	(0.124)	(0.097)	(0.124)	(0.072)	(0.109)	(0.085)	(0.127)
SMB	-0.243***	-0.259*	-0.077	-0.183	-0.209***	-0.350***	-0.291***	-0.387***
	(0.090)	(0.133)	(0.104)	(0.133)	(0.077)	(0.117)	(0.091)	(0.136)
HML	-0.059	-0.186	-0.092	-0.111	-0.041	-0.152	0.004	-0.075
	(0.113)	(0.166)	(0.130)	(0.166)	(0.096)	(0.147)	(0.113)	(0.171)
MOM	0.079	0.076	-0.055	0.012	0.007	0.025	0.024	-0.021
	(0.067)	(0.099)	(0.077)	(0.099)	(0.057)	(0.087)	(0.068)	(0.102)
MKTRF_DY	1.722*	0.183	-0.105	-0.183	0.402	-0.116	0.943	-1.201
	(0.898)	(1.325)	(1.035)	(1.323)	(0.767)	(1.168)	(0.904)	(1.360)
SMB_DY	-0.034	-1.208	2.095	-1.252	-0.683	-1.398	-0.290	-0.338
	(1.369)	(2.019)	(1.577)	(2.016)	(1.169)	(1.780)	(1.378)	(2.073)
HML_DY	-2.721*	-1.834	0.630	0.903	-2.615**	-1.469	-2.640*	-1.912
	(1.354)	(1.997)	(1.559)	(1.994)	(1.157)	(1.761)	(1.363)	(2.051)
MOM_DY	1.131	1.416	-0.622	-0.514	-0.552	-0.035	0.248	-0.534
	(0.866)	(1.278)	(0.998)	(1.276)	(0.740)	(1.127)	(0.872)	(1.312)
MKTRF_STR	0.296**	0.235	0.224	0.003	0.201**	0.244	0.206*	0.265
	(0.116)	(0.171)	(0.134)	(0.171)	(0.099)	(0.151)	(0.117)	(0.176)
SMB_STR	-0.304*	-0.117	-0.133	0.188	-0.196	-0.324	-0.114	-0.122
	(0.152)	(0.225)	(0.175)	(0.224)	(0.130)	(0.198)	(0.153)	(0.231)
HML_STR	0.257	0.135	0.242	0.064	0.363*	0.215	0.481**	0.352
	(0.215)	(0.317)	(0.247)	(0.316)	(0.183)	(0.279)	(0.216)	(0.325)
MOM_STR	0.092	0.172	0.004	0.111	0.004	-0.018	0.074	0.046
	(0.078)	(0.115)	(0.089)	(0.114)	(0.066)	(0.101)	(0.078)	(0.118)
DY	-0.047**	0.020	-0.003	0.049	-0.026	0.008	-0.057***	0.005
	(0.021)	(0.030)	(0.024)	(0.030)	(0.018)	(0.027)	(0.021)	(0.031)
STR	-0.006**	-0.004	-0.003	-0.002	-0.005**	-0.003	-0.007**	-0.004
	(0.003)	(0.004)	(0.003)	(0.004)	(0.002)	(0.004)	(0.003)	(0.004)
Constant (%)	-0.204	-0.169	-0.166	-0.113	-0.398**	-0.348	-0.383*	-0.340
(%)	(0.200)	(0.296)	(0.231)	(0.295)	(0.171)	(0.261)	(0.202)	(0.304)
$Wald_1$	0.0022	0.5181	0.6448	0.2837	0.0127	0.6751	0.0004	0.6255
$Wald_2$	0.0031	0.1465	0.3173	0.4125	0.0470	0.0936	0.0210	0.1818
$Wald_3$	0.0013	0.1556	0.3593	0.3631	0.0058	0.0838	0.0021	0.2101
Adjusted R-squared	0.350	0.103	0.030	0.029	0.288	0.147	0.330	0.080
Observations	60	60	60	60	60	60	60	60

Table 27. Performance of Long-Short portfolios - 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% long-short portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.034	0.039	0.027	-0.012	0.028	0.044	0.041	0.054
	(0.027)	(0.050)	(0.034)	(0.058)	(0.033)	(0.048)	(0.036)	(0.045)
SMB	-0.265***	-0.414***	-0.188*	-0.229**	-0.232***	-0.442***	-0.382***	-0.508***
	(0.076)	(0.097)	(0.099)	(0.114)	(0.067)	(0.097)	(0.080)	(0.100)
HML	-0.055	0.029	-0.056	-0.085	-0.065	0.024	-0.178***	-0.031
	(0.050)	(0.080)	(0.062)	(0.071)	(0.050)	(0.084)	(0.059)	(0.074)
MOM	0.008	0.043	0.089*	0.227***	-0.002	0.072*	0.028	0.054
	(0.037)	(0.038)	(0.047)	(0.076)	(0.027)	(0.041)	(0.037)	(0.046)
MKTRF_DY	0.044	-0.127	0.104	-0.195	0.011	-0.175	0.088	-0.036
	(0.123)	(0.196)	(0.139)	(0.268)	(0.156)	(0.183)	(0.133)	(0.166)
SMB_DY	0.062	-0.238	0.118	0.075	0.067	-0.181	-0.212	-0.425
	(0.218)	(0.270)	(0.308)	(0.277)	(0.188)	(0.276)	(0.213)	(0.266)
HML_DY	0.250	0.733**	0.221	0.259	0.263	0.570**	0.389*	0.591**
	(0.226)	(0.286)	(0.210)	(0.248)	(0.207)	(0.280)	(0.229)	(0.285)
MOM_DY	-0.315***	0.138	-0.224	0.238	-0.263***	0.149	-0.255**	0.122
	(0.077)	(0.139)	(0.139)	(0.170)	(0.095)	(0.144)	(0.112)	(0.140)
MKTRF_STR	0.084	0.163	0.082	0.108	0.101	0.160	0.133**	0.191**
	(0.065)	(0.106)	(0.061)	(0.094)	(0.068)	(0.097)	(0.062)	(0.077)
SMB_STR	0.146	0.177	0.093	0.228	0.076	0.156	-0.089	0.048
	(0.108)	(0.141)	(0.142)	(0.185)	(0.095)	(0.151)	(0.131)	(0.164)
HML_STR	0.142	0.279	0.017	0.141	0.127	0.149	0.267*	0.251
	(0.174)	(0.213)	(0.154)	(0.243)	(0.160)	(0.216)	(0.145)	(0.180)
MOM_STR	-0.194***	0.027	-0.096	0.242*	-0.077	0.115	-0.129*	0.011
	(0.049)	(0.131)	(0.094)	(0.132)	(0.078)	(0.121)	(0.071)	(0.089)
DY	-0.004	0.007	0.002	0.021*	-0.004	0.010	-0.008	0.005
	(0.007)	(0.009)	(0.006)	(0.011)	(0.007)	(0.010)	(0.006)	(0.007)
STR	-0.003	-0.004	0.001	0.003	-0.004	-0.004	-0.004	-0.005
	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.003)
Constant (%)	-0.278**	-0.181	-0.432***	-0.569***	-0.171	-0.122	-0.295**	-0.237
(%)	(0.116)	(0.181)	(0.114)	(0.161)	(0.120)	(0.186)	(0.143)	(0.178)
$Wald_1$	0.6512	0.3012	0.8879	0.1369	0.4485	0.2287	0.2421	0.1533
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.435	0.448	0.293	0.5253	0.336	0.434	0.575	0.551
Observations	72	72	72	72	72	72	72	72

Table 28. Performance of Long-Short portfolios - 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% long-short portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.061	0.104	0.106*	0.022	0.024	0.029	-0.015	-0.013
	(0.059)	(0.066)	(0.061)	(0.073)	(0.052)	(0.053)	(0.055)	(0.060)
SMB	-0.533***	-0.373***	-0.385***	-0.265***	-0.519***	-0.493***	-0.555***	-0.422***
	(0.064)	(0.072)	(0.066)	(0.070)	(0.056)	(0.059)	(0.059)	(0.065)
HML	-0.024	-0.073	-0.024	0.138	0.018	-0.111*	0.082	0.045
	(0.081)	(0.091)	(0.083)	(0.153)	(0.071)	(0.059)	(0.075)	(0.083)
MOM	-0.177***	-0.201***	-0.031	0.035	-0.133**	-0.078*	-0.149**	-0.126*
	(0.064)	(0.072)	(0.066)	(0.097)	(0.056)	(0.045)	(0.059)	(0.066)
MKTRF_DY	-0.132	0.502	-0.084	0.535	-0.236	1.020**	0.114	0.400
	(0.572)	(0.644)	(0.588)	(0.617)	(0.503)	(0.440)	(0.529)	(0.585)
SMB_DY	-0.147	0.834	0.168	0.115	-0.375	1.274	-0.383	0.849
	(1.026)	(1.155)	(1.054)	(1.219)	(0.902)	(1.128)	(0.949)	(1.049)
HML_DY	0.271	0.777	-0.850	0.596	0.309	1.803	0.943	0.653
	(1.238)	(1.394)	(1.272)	(1.323)	(1.089)	(1.177)	(1.145)	(1.267)
MOM_DY	0.225	1.642**	0.174	1.172	-0.300	1.858***	0.132	1.486**
	(0.688)	(0.774)	(0.706)	(0.734)	(0.605)	(0.558)	(0.636)	(0.703)
MKTRF_STR	-0.109	-0.181	-0.047	0.002	-0.033	-0.159	0.034	0.028
	(0.227)	(0.255)	(0.233)	(0.291)	(0.199)	(0.181)	(0.210)	(0.232)
SMB_STR	-0.836***	-0.505	-0.766**	-0.228	-0.582**	-0.730**	-0.648**	-0.273
	(0.280)	(0.315)	(0.288)	(0.341)	(0.246)	(0.302)	(0.259)	(0.287)
HML_STR	-1.093***	-0.969***	-0.541*	-0.243	-0.934***	-0.705**	-0.775***	-0.349
	(0.308)	(0.347)	(0.316)	(0.389)	(0.271)	(0.296)	(0.285)	(0.315)
MOM_STR	-0.988***	-0.652**	-0.533**	0.216	-0.769***	-0.170	-0.780***	0.035
	(0.243)	(0.274)	(0.250)	(0.225)	(0.214)	(0.209)	(0.225)	(0.249)
DY	0.034*	0.036	0.036*	0.058***	0.033*	0.043**	0.029	0.027
	(0.020)	(0.023)	(0.021)	(0.022)	(0.018)	(0.020)	(0.019)	(0.021)
STR	-0.013**	-0.011	-0.013*	-0.005	-0.010*	-0.003	-0.009	-0.000
	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Constant (%)	-0.357**	-0.250	-0.336*	-0.308	-0.429***	-0.234	-0.338**	-0.218
(%)	(0.166)	(0.187)	(0.170)	(0.233)	(0.146)	(0.179)	(0.153)	(0.169)
$Wald_1$	0.0275	0.0673	0.0282	0.0336	0.0316	0.1072	0.0728	0.4396
$Wald_2$	0.0000	0.0001	0.0001	0.0004	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.612	0.420	0.419	0.142	0.634	0.570	0.647	0.426
Observations	72	72	72	72	72	72	72	72

5.4. Discussion of results

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The question of how investors price environmental responsible securities is useful to interpret the results obtained in this study. If markets are efficient, any environmental information will be incorporated in market prices, so it is not possible to obtain abnormal returns using environmental screens. In contrast, if markets are inefficient, there is place for active management, conducted by profit-seeking socially responsible investors. This mispricing may exist if CSR value-relevant information is not properly valued by financial markets. Hence, the prediction that SRI can deliver anomalously high returns is the essence of the ‘‘errors-in-expectations hypothesis’’, developed by Derwall, Koedijk, and Horst (2011). This hypothesis is inconsistent with market efficiency as it assumes that CSR information is not fully incorporated into stock prices, which can be explained by two reasons pointed out by the authors. First, investors might lack the tools to measure the effects of CSR in the companies’ value. Second, accounting standards do not efficiently reflect the value added by CSR. On the other hand, according to the shunned-stock hypothesis, when values-driven investors neglect companies with lower standards of CSR, a scenario of undervalued shunned stocks may arise, enabling invertors to profit abnormally from such opportunities. By assuming a long position on controversial stocks, investors require an additional premium due to limited risk sharing caused by the smaller base of investors buying controversial stocks. Consequently, because of their inability to share risks with green investors, shareholders of controversial companies receive compensation for holding more shares of environmentally controversial firms. To the point of view of the values-driven investor who chooses to limit his holdings to responsible stocks, he theoretically might expect lower risk-adjusted returns.

Our results suggest that incorporating environmental constraints in investment decisions will impact portfolio performance in different ways depending on how portfolios are formed. Our regression estimates on equally-weighted portfolios formed on the Environmental pillar provide evidence of positive performance for high- and low-rated equally-weighted portfolios relative to the market, consistent with the inefficiency of the US financial market and accepting both the errors-in-expectations and shunned-stock hypotheses. However, if we approach the construction of the portfolios on a value-weighted basis, we find that there is neutral performance of the high- and low-rated Environmental Pillar portfolios. Furthermore, we evaluated portfolios formed on each of the three categories of the Environmental pillar and find that companies with higher standards might have neutral or negative performance (Product Innovation) when portfolios are formed on a value-weighted basis. Portfolios with lower standards are even able to outperform in the case of companies with lower environmental responsibility in terms product innovation. The long-short strategy applied to the portfolios formed on the Environmental pillar categories is consistent with the shunned-stock hypothesis, as it underperforms. However, when formed on the pillar criteria, long-short portfolios show neutral performance, reflecting the efficiency of the market.

The robustness tests performed allowed us to understand the consistency of our portfolios to the changes in some of the assumptions. The results are slightly different when changing the cut-offs used to form portfolios, and when the best-in-class screening approach is used. However, the weighting scheme leads to major changes in the performance of environmentally screened portfolios. Our analysis of the performance over time is consistent with the prediction of Derwall, Bauer, Guenster, and Koedijk (2011), that both values-driven and profit-seeking investors produce abnormal returns of SRI high-and low-rated portfolios that disappear in the long run, although with some interpretations restraints, such as considering the construction process of each portfolio.

The evidence presented in our study differs from that evidence of previous studies, as several studies find a positive impact of environmental screening on financial performance. There are possible explanations for these different results. One is that the database used to collect the scores of environmental data may differ and thereby the scores of the companies under evaluation might not be consistent across databases, which will affect portfolio formation and portfolio financial performance (Halbritter and Dorfleitner, 2015). On the other hand, the sample period used in this study is more recent, so markets may have become more gradually efficient on pricing environmental practices. Lastly, unlike the majority of the existing evidence, in our study we apply the conditional version of the four-factor model of Carhart (1997), while the mainly existing evidence on the performance of synthetic portfolios formed on CSR criteria uses the unconditional version of the model.

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6 Conclusion

The purpose of this research is to investigate the financial effects of investing in companies with high levels of environmental responsibility. In other words, we try to answer the question “Do investors have pay a premium for going green?”

Our research focuses on the evaluation of the financial performance of portfolios of US companies constructed on an environmental screening basis from 2003 to 2019. Environmental scores are collected from ASSET4 ESG database. Financial performance is evaluated through conditional performance evaluation models, which have not yet been used for this purpose. We form value- and equally-weighted portfolios based on the Environmental pillar and each of its three categories (Product Innovation, Resource Reduction and Emission Reduction). Using the positive screening approach, we form high- and low- rated portfolios corresponding to the best and worst 30% companies in each period, respectively. Portfolios are rebalanced yearly based on the score of the previous year, to make sure they correspond to the companies with the highest and lowest environmental conducts. Moreover, we constitute a long-short portfolio (long in the high-rated and short in the low- rated portfolio), to clarify differences in abnormal returns from investing in high- and low-rated portfolios.

The results obtained with equally-weighted portfolios indicate that there are no statistical differences in the performance of portfolios with higher and lower environmental standards, with exception of the portfolio formed on the Product Innovation category. However, low-rated portfolios formed on the Resource and Emission Reduction categories show a positive and significant performance relative to high-rates ones. Value-weighted high-rated portfolios have neutral performance, with exception of the portfolio formed on the Product Innovation category, which shows negative performance. Taking these results into consideration, and turning to our main question, we think it is fair to say that it is likely that the responsible investor does not pay a premium for going green. Low-rated portfolios formed under value-weighted method show neutral performance, with the exception of the portfolio constructed on the Product Innovation category, which seems to provide positive abnormal returns. Nonetheless, the investigation of performance of the long-short portfolio allows us to conclude that going long on high-rated companies and short on low rated ones can be defined as “doing good but not so well”, as the majority of portfolios formed on the three categories significantly underperform. However, if the environmentally responsible investor forms portfolios based on the aggregate Environmental pillar, he may “do good and well enough”, as the later shows neutral performance. The answer to our main question does not change with the robustness tests. However, the results present several differences relatively to the positive screening strategy, concerning the investment style and existence of abnormal returns. For the majority of the cases, we observe that buying environmentally responsible portfolios will not hurt investors' performance regardless of the cut-off or wheightning scheme chosen. Investors may even benefit from abnormal ruturns by choosing to go long on environmental responsible companies if they use the equally-weighted scheme to form the portfolios, since only two equally-weighted portfolios do not show abnormal returns. The changes in portfolio performance linked to the best-in-class approach are minimal. Nevertheless, we highlight the fact that best-in-class portfolios never underperform and their alpha coefficients are more close to zero.

We also performed an analysis of performance across different sub-periods to assess the evolution of portfolio performance over time. This analysis allows us to conclude that markets have become increasingly efficient regarding the incorporation of information on the environmental responsibility of the firm in security prices. We observe that high- and low-rated portfolios lose their outperformance over time, as documented in previous studies regarding SRI (e.g., Pereira, Cortez, and Silva, 2019; Derwall, Guenster, Bauer, and Koedijk, 2005; and Derwall, Bauer, Guenster, and Koedijk, 2011). The results on the last two sub-periods reflect markets becoming more informationally efficient, as the number of portfolios with neutral performance starts to increase, mainly when formed on an equally-weighted basis. The neutral effect is consistent with the "no effect" hypothesis mentioned by Statman and Glushkov (2009), according to which the expected returns of socially responsible stocks are approximately equal to the expected returns of conventional stocks assuming a world where the social responsibility feature of stocks has no effect on returns.

Regarding investment style, our results allow us to refute the hypothesis that environmental screening reduces the scope of companies to pick and therefore portfolios will suffer from a lack of diversification (Trinks, Scholtens, Mulder and Dam, 2018). High-rated portfolios are more exposed to value companies, although through the study of different sub-periods we observed that in the first sub-period environmentally responsible companies were growth oriented, but over time they shifted their exposition towards value stocks. Low-rated portfolios are more correlated with returns of small companies than high-rated portfolios. Portfolios formed on different categories show slightly different investment styles.

In sum, if there were times that investor could profit by having ethical choices, it does not look like this is the case anymore, since the results, overall, point to a neutral performance. The good news is that environmentally friendly investors do not pay a premium for going green.

This study addresses an important matter concerning socially responsible investors, and our results are useful to both academics, wealth managers, retail and institutional investors. However, our study has some limitations. The most important one is related with the absence of transaction costs in estimating the returns of our portfolios. Further research might consider the possibility of constructing score-weighted portfolios to minimize biases of including companies with lower scores in the portfolios.

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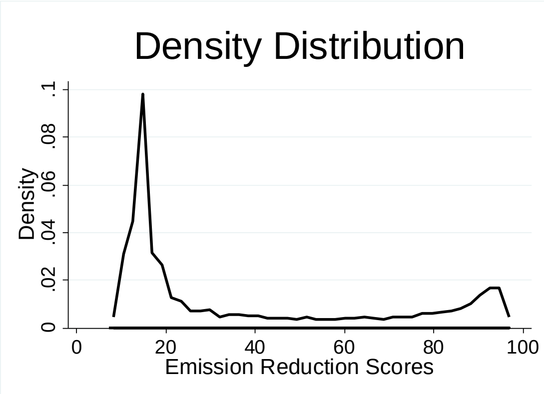
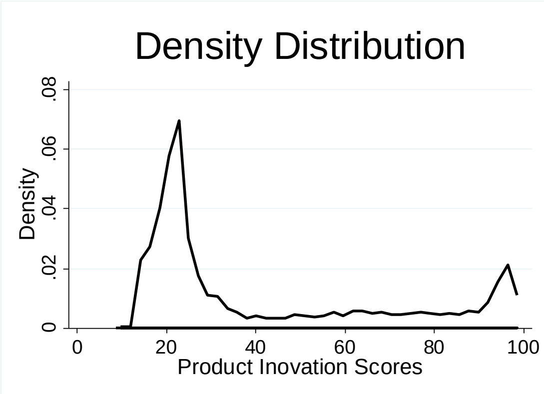
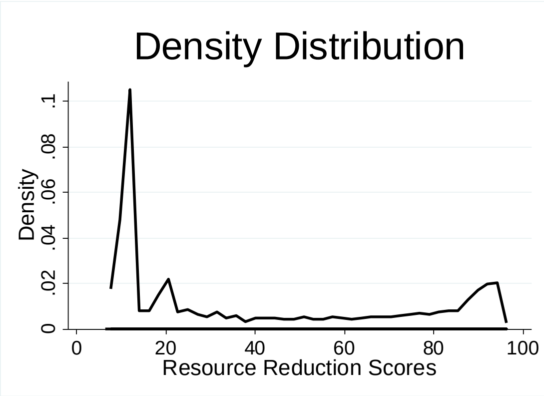
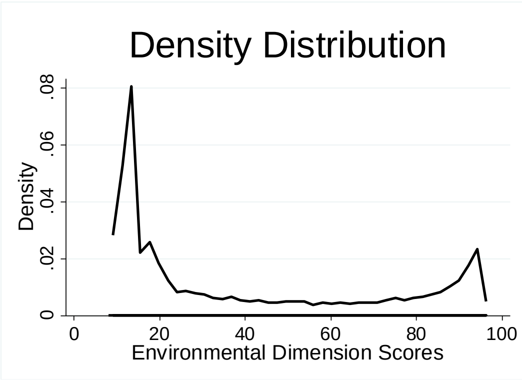
Appendix A. Density Graph of Environmental Scores and Respective Categories









Appendix B. Industry Statistics

High -Rated 10%Cut Off Portfolios

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Technology	272	16.60	264	16.15	145	8.90	217	13.18
Telecommunications	64	3.90	58	3.55	50	3.07	57	3.46
Health Care	135	8.24	79	4.83	110	6.75	161	9.78
Financials	117	7.14	95	5.81	156	9.57	118	7.17
Real Estate	33	2.01	42	2.57	101	6.20	41	2.49
Consumer Discretionary	229	13.97	255	15.60	289	17.73	230	13.97
Consumer Staples	150	9.15	125	7.65	110	6.75	200	12.15
Industrials	368	22.45	452	27.65	317	19.45	273	16.59
Basic Materials	121	7.38	140	8.56	125	7.67	104	6.32
Energy	59	3.60	60	3.67	103	6.32	95	5.77
Utilities	91	5.55	65	3.98	124	7.61	150	9.11
Total	1639	100.00	1635	100.00	1630	100.00	1646	100.00

Low- Rated 10%Cut Off Portfolios

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Technology	85	4.61	148	7.91	108	5.27	83	3.98
Telecommunications	46	2.50	38	2.03	46	2.24	79	3.79
Health Care	158	8.57	201	10.75	192	9.36	97	4.65
Financials	990	53.72	555	29.68	1043	50.85	1102	52.83
Real Estate	126	6.84	53	2.83	214	10.43	325	15.58
Consumer Discretionary	187	10.15	299	15.99	218	10.63	207	9.92
Consumer Staples	18	0.98	64	3.42	22	1.07	7	0.34
Industrials	162	8.79	247	13.21	136	6.63	112	5.37
Basic Materials	13	0.71	53	2.83	12	0.59	17	0.81
Energy	50	2.71	186	9.95	49	2.39	44	2.11
Utilities	8	0.43	26	1.39	11	0.54	13	0.62
Total	1843	100.00	1870	100.00	2051	100.00	2086	100.00

High Rated 30% Cut-off Portfolios

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Technology	578	11.82	644	13.09	570	11.33	531	10.91
Telecommunications	134	2.74	163	3.31	152	3.02	115	2.36
Health Care	348	7.11	290	5.89	427	8.49	359	7.37
Financials	387	7.91	328	6.67	401	7.97	410	8.42
Real Estate	190	3.88	170	3.45	210	4.17	203	4.17
Consumer Discretionary	814	16.64	853	17.33	951	18.90	783	16.08
Consumer Staples	410	8.38	356	7.23	463	9.20	409	8.40
Industrials	984	20.11	1210	24.59	939	18.66	876	17.99
Basic Materials	368	7.52	370	7.52	344	6.84	364	7.48
Energy	288	5.89	210	4.27	265	5.27	353	7.25
Utilities	391	7.99	327	6.64	309	6.14	466	9.57
Total	4892	100.00	4921	100.00	5031	100.00	4869	100.00

Low-Rated 30% Cut Off Portfolio

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Technology	374	7.63	406	8.10	469	8.55	480	8.78
Telecommunications	131	2.67	120	2.39	153	2.79	171	3.13
Health Care	749	15.28	628	12.52	817	14.90	888	16.24
Financials	1648	33.62	1419	28.30	1543	28.14	1516	27.72
Real Estate	397	8.10	321	6.40	427	7.79	452	8.26
Consumer Discretionary	732	14.93	807	16.09	889	16.21	898	16.42
Consumer Staples	87	1.77	123	2.45	116	2.12	108	1.97
Industrials	464	9.47	585	11.67	647	11.80	616	11.26
Basic Materials	70	1.43	135	2.69	96	1.75	80	1.46
Energy	216	4.41	433	8.63	259	4.72	209	3.82
Utilities	34	0.69	38	0.76	67	1.22	51	0.93
Total	4902	100.00	5015	100.00	5483	100.00	5469	100.00

High Rated 50% Cut-Off Portfolio

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Technology	898	11.08	1005	12.19	976	11.28	886	10.69
Telecommunications	217	2.68	254	3.08	246	2.84	210	2.53
Health Care	612	7.55	740	8.98	844	9.75	593	7.16
Financials	620	7.65	614	7.45	701	8.10	750	9.05
Real Estate	415	5.12	487	5.91	440	5.08	427	5.15
Consumer Discretionary	1453	17.93	1425	17.28	1566	18.10	1466	17.69
Consumer Staples	588	7.26	553	6.71	621	7.18	603	7.28
Industrials	1647	20.33	1737	21.07	1631	18.85	1557	18.79
Basic Materials	526	6.49	475	5.76	529	6.11	541	6.53
Energy	550	6.79	412	5.00	569	6.57	672	8.11
Utilities	577	7.12	543	6.59	531	6.14	580	7.00
Total	8103	100.00	8245	100.00	8654	100.00	8285	100.00

Low Rated 50% Cut-Off Portfolio

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Technology	749	9.31	637	8.08	680	9.08	794	9.55
Telecommunications	222	2.76	186	2.36	196	2.62	238	2.86
Health Care	1195	14.86	1068	13.54	1011	13.50	1241	14.93
Financials	2002	24.89	2005	25.42	1906	25.44	1948	23.44
Real Estate	693	8.62	622	7.89	658	8.78	720	8.66
Consumer Discretionary	131	16.29	1336	16.94	119	15.89	1391	16.73
Consumer Staples	194	2.41	228	2.89	147	1.96	198	2.38
Industrials	944	11.74	850	10.78	951	12.70	1117	13.44
Basic Materials	176	2.19	225	2.85	159	2.12	178	2.14
Energy	466	5.79	603	7.65	459	6.13	381	4.58
Utilities	92	1.14	126	1.60	134	1.79	106	1.28
Total	8043	100.00	7886	100.00	7491	100.00	8312	100.00

Appendix C. Performance of portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) - positive screening approach

High Rated 50% Cut-Off

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% high-rated portfolio. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.057***	0.997***	1.072***	0.939***	1.055***	1.001***	1.050***	0.972***
	(0.024)	(0.013)	(0.022)	(0.041)	(0.024)	(0.019)	(0.024)	(0.015)
SMB	0.274***	-0.156***	0.292***	-0.118***	0.291***	-0.150***	0.270***	-0.131***
	(0.035)	(0.021)	(0.035)	(0.037)	(0.039)	(0.020)	(0.034)	(0.021)
HML	0.139***	0.067**	0.073**	0.028	0.114***	0.017	0.140***	0.061***
	(0.036)	(0.029)	(0.031)	(0.027)	(0.036)	(0.017)	(0.036)	(0.022)
MOM	-0.144***	-0.047***	-0.163***	-0.021	-0.154***	-0.026*	-0.147***	-0.007
	(0.023)	(0.014)	(0.026)	(0.020)	(0.029)	(0.014)	(0.024)	(0.017)
MKTRF_DY	0.979	-1.407***	1.080	-1.014**	1.263	-1.077***	1.227	-0.576
	(0.639)	(0.469)	(0.691)	(0.434)	(0.838)	(0.329)	(0.780)	(0.445)
SMB_DY	-2.353	0.337	-2.546*	0.149	-2.608	0.821	-1.640	-0.006
	(1.482)	(1.113)	(1.341)	(1.062)	(1.894)	(0.911)	(1.722)	(1.197)
HML_DY	0.022	-1.759	1.437	-0.976	1.144	-0.105	0.133	-0.377
	(1.498)	(1.068)	(1.179)	(0.717)	(1.783)	(0.581)	(1.740)	(0.812)
MOM_DY	0.903	-0.578	1.966**	-0.437	1.481	-0.320	0.923	-0.907
	(0.785)	(0.483)	(0.837)	(0.540)	(1.124)	(0.469)	(1.096)	(0.593)
MKTRF_STR	-0.879	1.190***	-0.969*	0.829**	-1.107	0.926***	-1.091	0.490
	(0.543)	(0.403)	(0.585)	(0.378)	(0.713)	(0.285)	(0.662)	(0.383)
SMB_STR	2.036	-0.271	2.173*	-0.091	2.293	-0.687	1.462	0.063
	(1.254)	(0.953)	(1.138)	(0.917)	(1.604)	(0.783)	(1.464)	(1.030)
HML_STR	0.090	1.424	-1.152	0.737	-0.911	0.012	0.007	0.323
	(1.234)	(0.880)	(0.975)	(0.590)	(1.473)	(0.472)	(1.437)	(0.672)
MOM_STR	-0.758	0.433	-1.683**	0.344	-1.220	0.248	-0.781	0.774
	(0.670)	(0.414)	(0.707)	(0.464)	(0.949)	(0.405)	(0.945)	(0.514)
DY	-0.030	0.011	-0.031	-0.000	-0.042	-0.013	-0.046	-0.018
	(0.032)	(0.021)	(0.030)	(0.020)	(0.041)	(0.016)	(0.039)	(0.022)
STR	0.023	-0.009	0.025	0.001	0.034	0.011	0.036	0.017
	(0.027)	(0.018)	(0.025)	(0.018)	(0.035)	(0.014)	(0.033)	(0.019)
Constant (%)	0.191***	-0.004	0.186**	0.063	0.227***	0.006	0.181**	0.041
(%)	(0.066)	(0.044)	(0.072)	(0.061)	(0.076)	(0.042)	(0.076)	(0.045)
$Wald_1$	0.0705	0.8107	0.3199	0.9436	0.0796	0.613	0.1035	0.3792
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.969	0.977	0.965	0.953	0.963	0.984	0.965	0.975
Observations	204	204	204	204	204	204	204	204

High Rated 10% Cut-Off

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% high-rated portfolio. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1, Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.071***	0.969***	1.116***	0.978***	1.013***	1.056***	0.939***	0.892***
	(0.022)	(0.020)	(0.026)	(0.021)	(0.023)	(0.044)	(0.048)	(0.046)
SMB	0.015	-0.280***	0.098**	-0.261***	0.025	-0.041	-0.031	-0.247***
	(0.031)	(0.031)	(0.040)	(0.037)	(0.032)	(0.058)	(0.059)	(0.058)
HML	0.063**	0.026	0.102**	0.047	0.056	0.019	0.129***	0.015
	(0.030)	(0.032)	(0.041)	(0.034)	(0.035)	(0.067)	(0.043)	(0.041)
MOM	-0.142***	-0.030	-0.157***	-0.033	-0.109***	-0.133**	-0.095***	-0.022
	(0.023)	(0.025)	(0.031)	(0.024)	(0.024)	(0.056)	(0.029)	(0.027)
MKTRF_DY	-0.173	-1.135	1.017	-0.446	-0.086	-1.014	-0.270	-1.327*
	(0.885)	(0.782)	(0.912)	(0.898)	(1.124)	(1.555)	(1.000)	(0.691)
SMB_DY	1.338	1.448	0.322	2.030	2.675**	3.388	0.284	1.944
	(1.320)	(1.691)	(1.827)	(2.022)	(1.279)	(2.968)	(1.416)	(1.554)
HML_DY	-0.055	-1.036	-0.543	-0.809	-0.317	2.097	0.218	-1.173
	(1.214)	(1.212)	(1.540)	(1.251)	(1.352)	(2.565)	(1.826)	(1.413)
MOM_DY	0.898	-0.673	0.965	-0.302	0.099	1.139	0.252	-1.085
	(0.778)	(0.879)	(0.969)	(0.872)	(0.652)	(1.117)	(1.118)	(1.057)
MKTRF_STR	0.191	1.012	-0.884	0.390	0.065	0.800	0.172	1.086*
	(0.752)	(0.669)	(0.768)	(0.767)	(0.966)	(1.302)	(0.855)	(0.593)
SMB_STR	-1.203	-1.190	-0.274	-1.728	-2.342**	-2.772	-0.159	-1.587
	(1.110)	(1.438)	(1.556)	(1.723)	(1.083)	(2.560)	(1.191)	(1.337)
HML_STR	0.033	0.758	0.494	0.511	0.242	-1.725	-0.152	0.808
	(1.011)	+(0.991)	(1.266)	(1.027)	(1.136)	(2.146)	(1.518)	(1.166)
MOM_STR	-0.782	0.498	-0.860	0.198	-0.082	-0.943	-0.207	0.902
	(0.667)	(0.749)	(0.809)	(0.749)	(0.564)	(0.982)	(0.959)	(0.913)
DY	-0.018	0.024	-0.041	-0.011	-0.012	0.059	0.005	0.039
	(0.030)	(0.034)	(0.041)	(0.038)	(0.027)	(0.075)	(0.032)	(0.037)
STR	0.015	-0.019	0.033	0.010	0.010	-0.054	-0.004	-0.032
	(0.026)	(0.029)	(0.035)	(0.033)	(0.023)	(0.065)	(0.028)	(0.032)
Constant (%)	0.079	-0.024	0.142	-0.066	0.172**	0.200	0.328**	0.174
(%)	(0.075)	(0.074)	(0.093)	(0.086)	(0.075)	(0.129)	(0.132)	(0.123)
$Wald_1$	0.8059	0.4689	0.3380	0.8927	0.9096	0.4214	0.9431	0.1991
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.956	0.932	0.944	0.930	0.953	0.867	0.864	0.824
Observations	204	204	204	204	204	204	204	204

Low Rated 50% Cut-Off

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% low-rated portfolio. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.021***	0.980***	1.001***	0.906***	1.010***	0.996***	1.017***	1.024***
	(0.028)	(0.038)	(0.029)	(0.039)	(0.030)	(0.030)	(0.029)	(0.030)
SMB	0.483***	0.266***	0.487***	0.120***	0.474***	0.199***	0.481***	0.197***
	(0.050)	(0.063)	(0.044)	(0.034)	(0.053)	(0.047)	(0.056)	(0.052)
HML	0.054*	-0.094***	0.116***	-0.025	0.076**	-0.027	0.062	-0.097***
	(0.030)	(0.034)	(0.029)	(0.033)	(0.036)	(0.031)	(0.039)	(0.037)
MOM	-0.122***	-0.122***	-0.133***	-0.069**	-0.150***	-0.082***	-0.155***	-0.071**
	(0.021)	(0.039)	(0.027)	(0.030)	(0.024)	(0.025)	(0.029)	(0.030)
MKTRF_DY	0.955	1.539	1.806**	0.944	1.480*	0.756	1.488*	0.352
	(0.951)	(1.471)	(0.847)	(0.782)	(0.840)	(0.997)	(0.784)	(0.794)
SMB_DY	-2.158	-1.830	-2.095	0.658	-3.314	-1.396	-4.243*	-1.498
	(2.040)	(1.774)	(1.620)	(1.284)	(2.143)	(1.679)	(2.290)	(1.747)
HML_DY	0.854	3.107	2.496**	2.529**	2.405**	1.745	3.486***	2.629**
	(1.202)	(2.032)	(1.225)	(1.030)	(1.013)	(1.149)	(1.232)	(1.145)
MOM_DY	0.070	1.568	-0.089	-0.401	-0.187	-0.000	0.397	0.315
	(1.020)	(1.710)	(1.405)	(0.870)	(1.150)	(1.223)	(1.150)	(0.843)
MKTRF_STR	-0.890	-1.401	-1.585**	-0.853	-1.326*	-0.743	-1.312**	-0.341
	(0.810)	(1.254)	(0.729)	(0.679)	(0.709)	(0.838)	(0.664)	(0.665)
SMB_STR	1.931	1.571	1.894	-0.623	2.859	1.115	3.634*	1.130
	(1.752)	(1.518)	(1.383)	(1.092)	(1.814)	(1.444)	(1.929)	(1.473)
HML_STR	-0.686	-2.660	-1.969*	-2.089**	-1.883**	-1.315	-2.857***	-2.218**
	(1.002)	(1.699)	(1.002)	(0.861)	(0.815)	(0.948)	(1.002)	(0.926)
MOM_STR	0.015	-1.295	0.195	0.403	0.225	0.017	-0.237	-0.205
	(0.906)	(1.496)	(1.220)	(0.762)	(1.000)	(1.075)	(0.986)	(0.726)
DY	-0.057	-0.090**	-0.078*	-0.130***	-0.073**	-0.106**	-0.071*	-0.090**
	(0.039)	(0.042)	(0.041)	(0.031)	(0.035)	(0.043)	(0.038)	(0.036)
STR	0.050	0.077**	0.067*	0.114***	0.065**	0.094**	0.062*	0.080**
	(0.033)	(0.037)	(0.035)	(0.027)	(0.030)	(0.037)	(0.033)	(0.031)
Constant (%)	0.216**	0.149	0.209**	0.102	0.163	0.002	0.199**	0.015
(%)	(0.094)	(0.104)	(0.093)	(0.085)	(0.100)	(0.00085)	(0.097)	(0.078)
$Wald_1$	0.2403	0.0823	0.1700	0.0002	0.0301	0.0158	0.0927	0.0245
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.961	0.934	0.957	0.927	0.952	0.933	0.953	0.940
Observations	204	204	204	204	204	204	204	204

Low Rated 10% Cut-Off

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% low-rated portfolio. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.982***	0.873***	1.021***	0.958***	0.981***	0.904***	0.975***	0.946***
	(0.046)	(0.043)	(0.030)	(0.033)	(0.041)	(0.034)	(0.036)	(0.047)
SMB	0.407***	0.072	0.417***	0.132***	0.329***	0.057	0.387***	0.035
	(0.071)	(0.058)	(0.050)	(0.050)	(0.062)	(0.054)	(0.051)	(0.079)
HML	0.328***	0.133*	0.167***	0.044	0.267***	0.183***	0.339***	0.169**
	(0.065)	(0.071)	(0.046)	(0.051)	(0.054)	(0.052)	(0.047)	(0.073)
MOM	-0.068	-0.013	-0.155***	-0.060*	-0.108***	-0.075**	-0.123***	-0.210***
	(0.042)	(0.042)	(0.031)	(0.034)	(0.038)	(0.036)	(0.036)	(0.064)
MKTRF_DY	-2.674	-5.064**	1.482	1.434	-1.413	-2.774	-1.562	-0.021
	(1.839)	(2.181)	(1.330)	(1.228)	(1.961)	(2.042)	(2.190)	(2.864)
SMB_DY	2.861	3.722	-2.012	1.471	0.657	-0.719	1.689	-3.598
	(2.763)	(2.703)	(2.448)	(2.244)	(2.916)	(1.967)	(2.446)	(4.758)
HML_DY	0.162	0.502	-1.161	-1.102	5.474**	4.909**	3.754*	9.560**
	(2.156)	(2.633)	(2.004)	(1.821)	(2.253)	(1.987)	(2.124)	(4.095)
MOM_DY	-4.816***	-4.076***	-2.638	-1.730	-1.297	-0.449	-2.690**	2.306
	(1.434)	(1.276)	(1.908)	(1.194)	(1.645)	(0.932)	(1.353)	(2.686)
MKTRF_STR	2.311	4.346**	-1.285	-1.118	1.307	2.405	1.384	-0.067
	(1.548)	(1.819)	(1.134)	(1.045)	(1.655)	(1.721)	(1.866)	(2.449)
SMB_STR	-2.296	-3.218	1.726	-1.594	-0.601	0.581	-1.460	3.053
	(2.344)	(2.316)	(2.101)	(1.914)	(2.506)	(1.716)	(2.094)	(4.101)
HML_STR	-0.210	-0.532	1.212	1.043	-4.607**	-4.302**	-3.199*	-8.462**
	(1.772)	(2.182)	(1.671)	(1.510)	(1.868)	(1.692)	(1.782)	(3.384)
MOM_STR	4.282***	3.529***	2.312	1.458	1.343	0.486	2.473**	-1.788
	(1.204)	(1.091)	(1.667)	(1.029)	(1.417)	(0.804)	(1.170)	(2.279)
DY	-0.097**	-0.161***	-0.094*	-0.159***	-0.014	-0.090**	-0.022	-0.034
	(0.044)	(0.042)	(0.048)	(0.047)	(0.058)	(0.040)	(0.050)	(0.104)
STR	0.086**	0.144***	0.077*	0.136***	0.014	0.080**	0.022	0.026
	(0.037)	(0.036)	(0.042)	(0.040)	(0.049)	(0.034)	(0.042)	(0.090)
Constant (%)	0.255**	0.077	0.165	0.039	0.066	0.111	0.139	0.457***
(%)	(0.129)	(0.113)	(0.105)	(0.112)	(0.116)	(0.088)	(0.108)	(0.171)
$Wald_1$	0.0384	0.0000	0.0383	0.0031	0.6194	0.0050	0.1586	0.6952
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.897	0.846	0.922	0.881	0.911	0.896	0.923	0.861
Observations	204	204	204	204	204	204	204	204

Long-Short 50% Cut- Off

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% long-short portfolio. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.076***	0.017	0.071***	0.033	0.045*	0.005	0.033	-0.052
	(0.028)	(0.037)	(0.025)	(0.053)	(0.023)	(0.030)	(0.023)	(0.032)
SMB	0.008	-0.423***	-0.195***	-0.238***	-0.183***	-0.349***	-0.211***	-0.328***
	(0.045)	(0.060)	(0.034)	(0.049)	(0.039)	(0.045)	(0.041)	(0.054)
HML	0.233***	0.161***	-0.043	0.052	0.038	0.044	0.077*	0.157***
	(0.047)	(0.050)	(0.033)	(0.046)	(0.043)	(0.036)	(0.044)	(0.049)
MOM	-0.022	0.075*	-0.030	0.047	-0.004	0.056*	0.008	0.064
	(0.039)	(0.039)	(0.028)	(0.037)	(0.031)	(0.029)	(0.028)	(0.039)
MKTRF_DY	-0.560	-2.946*	-0.726	-1.958*	-0.217	-1.833*	-0.261	-0.929
	(1.120)	(1.682)	(0.885)	(1.038)	(1.154)	(1.027)	(0.964)	(0.842)
SMB_DY	-0.523	2.167	-0.452	-0.509	0.706	2.216	2.603	1.492
	(1.515)	(1.833)	(1.341)	(1.741)	(1.641)	(1.669)	(1.922)	(1.871)
HML_DY	-3.085	-4.866*	-1.059	-3.505**	-1.261	-1.850	-3.353*	-3.006*
	(2.069)	(2.710)	(1.192)	(1.370)	(1.969)	(1.450)	(1.734)	(1.524)
MOM_DY	-0.665	-2.146	2.056**	-0.036	1.668	-0.320	0.526	-1.222
	(1.398)	(2.042)	(0.953)	(1.084)	(1.191)	(1.517)	(1.020)	(1.015)
MKTRF_STR	0.522	2.592*	0.616	1.681*	0.220	1.669*	0.220	0.830
	(0.964)	(1.434)	(0.754)	(0.893)	(0.959)	(0.865)	(0.804)	(0.709)
SMB_STR	0.465	-1.842	0.279	0.532	-0.565	-1.803	-2.173	-1.067
	(1.293)	(1.564)	(1.134)	(1.485)	(1.386)	(1.436)	(1.625)	(1.583)
HML_STR	2.751	4.084*	0.817	2.826**	0.972	1.326	2.863**	2.540**
	(1.711)	(2.248)	(0.983)	(1.148)	(1.603)	(1.189)	(1.410)	(1.226)
MOM_STR	0.537	1.728	-1.878**	-0.060	-1.445	0.230	-0.544	0.979
	(1.215)	(1.787)	(0.821)	(0.948)	(0.997)	(1.333)	(0.866)	(0.880)
DY	0.060*	0.101**	0.047	0.130***	0.031	0.094**	0.025	0.072*
	(0.035)	(0.041)	(0.030)	(0.042)	(0.042)	(0.047)	(0.041)	(0.041)
STR	-0.054*	-0.086**	-0.042	-0.113***	-0.032	-0.084**	-0.026	-0.063*
	(0.030)	(0.036)	(0.026)	(0.036)	(0.036)	(0.041)	(0.035)	(0.035)
Constant (%)	-0.057	-0.252**	-0.123	-0.139	-0.036	-0.095	-0.117	-0.074
(%)	(0.105)	(0.114)	(0.086)	(0.116)	(0.092)	(0.097)	(0.092)	(0.093)
$Wald_1$	0.1499	0.0345	0.1936	0.0086	0.0010	0.0622	0.0098	0.2055
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.176	0.443	0.198	0.154	0.113	0.322	0.197	0.363
Observations	204	204	204	204	204	204	204	204

Long-Short 10% Cut-Off

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% long-short portfolio. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.089**	0.096*	0.096***	0.020	0.031	0.152***	-0.036	-0.054
	(0.044)	(0.051)	(0.034)	(0.041)	(0.041)	(0.054)	(0.056)	(0.064)
SMB	-0.392***	-0.352***	-0.319***	-0.393***	-0.303***	-0.098	-0.418***	-0.282***
	(0.069)	(0.061)	(0.056)	(0.063)	(0.062)	(0.064)	(0.083)	(0.099)
HML	-0.265***	-0.107	-0.064	0.003	-0.211***	-0.163*	-0.210***	-0.154*
	(0.075)	(0.073)	(0.052)	(0.063)	(0.070)	(0.090)	(0.068)	(0.090)
MOM	-0.075	-0.016	-0.002	0.027	-0.002	-0.057	0.028	0.189***
	(0.051)	(0.050)	(0.040)	(0.045)	(0.039)	(0.061)	(0.047)	(0.072)
MKTRF_DY	2.501	3.929*	-0.465	-1.880	1.326	1.760	1.292	-1.305
	(2.603)	(2.258)	(1.561)	(1.827)	(1.571)	(1.797)	(2.077)	(3.105)
SMB_DY	-1.523	-2.274	2.334	0.559	2.018	4.107	-1.405	5.542
	(2.812)	(3.121)	(2.695)	(3.869)	(2.706)	(3.061)	(2.619)	(5.440)
HML_DY	-0.217	-1.538	0.618	0.293	-5.791**	-2.811	-3.537	-10.733**
	(2.995)	(2.631)	(2.320)	(2.486)	(2.744)	(3.206)	(3.161)	(4.204)
MOM_DY	5.714***	3.403**	3.603*	1.427	1.396	1.589	2.942*	-3.392
	(2.067)	(1.355)	(2.039)	(2.234)	(1.697)	(1.477)	(1.648)	(3.035)
MKTRF_STR	-2.121	-3.334*	0.401	1.509	-1.242	-1.605	-1.212	1.154
	(2.205)	(1.894)	(1.312)	(1.546)	(1.328)	(1.540)	(1.763)	(2.685)
SMB_STR	1.093	2.028	-2.000	-0.134	-1.740	-3.352	1.301	-4.640
	(2.406)	(2.680)	(2.309)	(3.327)	(2.330)	(2.632)	(2.224)	(4.701)
HML_STR	0.243	1.290	-0.718	-0.532	4.849**	2.577	3.047	9.270***
	(2.486)	(2.175)	(1.912)	(2.084)	(2.262)	(2.693)	(2.589)	(3.488)
MOM_STR	-5.064***	-3.031***	-3.172*	-1.260	-1.425	-1.429	-2.680*	2.690
	(1.774)	(1.158)	(1.765)	(1.937)	(1.463)	(1.279)	(1.377)	(2.587)
DY	0.079	0.184***	0.053	0.148*	0.002	0.150*	0.026	0.073
	(0.069)	(0.060)	(0.059)	(0.076)	(0.057)	(0.078)	(0.055)	(0.115)
STR	-0.070	-0.163***	-0.044	-0.126*	-0.004	-0.134*	-0.026	-0.058
	(0.059)	(0.051)	(0.051)	(0.066)	(0.049)	(0.068)	(0.047)	(0.100)
Constant (%)	-0.276*	-0.201	-0.123	-0.205	0.006	-0.011	0.089	-0.383*
(%)	(0.150)	(0.141)	(0.128)	(0.158)	(0.132)	(0.143)	(0.167)	(0.222)
$Wald_1$	0.2889	0.0007	0.5221	0.1308	0.6888	0.0308	0.2264	0.3353
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0012	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000
Adjusted R-squared	0.229	0.142	0.164	0.185	0.347	0.119	0.319	0.416
Observations	204	204	204	204	204	204	204	204

Appendix D. Performance of portfolios formed on the Environmental pillar and its three categories (Product Innovation, Resource Reduction and Emission Reduction) - positive screening approach for different sub-periods and different Cut offs

Long-short portfolios 50% cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% long-short portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.013	0.004	-0.065	-0.094	0.045	0.009	0.078	0.022
	(0.133)	(0.097)	(0.067)	(0.106)	(0.118)	(0.102)	(0.120)	(0.131)
SMB	0.198	-0.302***	-0.103	-0.236**	0.034	-0.196*	-0.002	-0.139
	(0.141)	(0.104)	(0.089)	(0.114)	(0.126)	(0.108)	(0.129)	(0.112)
HML	0.242*	0.086	-0.029	-0.129	-0.115	-0.214	-0.034	0.016
	(0.129)	(0.130)	(0.106)	(0.143)	(0.158)	(0.191)	(0.161)	(0.200)
MOM	0.054	0.042	-0.069	-0.081	0.123	0.010	0.124	0.035
	(0.106)	(0.078)	(0.084)	(0.085)	(0.094)	(0.099)	(0.096)	(0.084)
MKTRF_DY	-0.711	-0.617	0.661	0.151	1.644	0.597	1.072	-0.020
	(0.906)	(1.039)	(1.028)	(1.137)	(1.261)	(0.993)	(1.287)	(1.091)
SMB_DY	2.736	-0.624	3.746*	-0.390	1.288	-1.908	0.733	-1.432
	(1.751)	(1.583)	(2.014)	(1.732)	(1.922)	(2.209)	(1.961)	(2.313)
HML_DY	1.401	-0.870	1.991	0.931	-1.118	-2.033	-0.626	-0.440
	(1.210)	(1.565)	(1.220)	(1.713)	(1.901)	(1.226)	(1.940)	(1.321)
MOM_DY	-0.260	0.239	-2.079**	-0.771	2.357*	2.602***	1.593	2.134**
	(0.981)	(1.002)	(0.879)	(1.096)	(1.216)	(0.827)	(1.241)	(0.953)
MKTRF_STR	-0.030	0.058	0.106	0.114	0.038	0.185	0.126	0.262*
	(0.163)	(0.134)	(0.085)	(0.147)	(0.163)	(0.120)	(0.166)	(0.154)
SMB_STR	-0.298	-0.154	-0.216	0.003	-0.224	-0.133	-0.238	0.017
	(0.202)	(0.176)	(0.149)	(0.193)	(0.214)	(0.171)	(0.218)	(0.176)
HML_STR	0.176	0.264	-0.053	-0.141	0.060	0.037	0.267	0.470
	(0.304)	(0.248)	(0.231)	(0.272)	(0.301)	(0.368)	(0.308)	(0.358)
MOM_STR	0.135	0.117	-0.015	0.031	0.091	-0.009	0.123	0.080
	(0.100)	(0.090)	(0.101)	(0.098)	(0.109)	(0.101)	(0.111)	(0.086)
DY	0.011	0.026	-0.009	0.032	-0.028	0.032	-0.026	0.034
	(0.018)	(0.024)	(0.019)	(0.026)	(0.029)	(0.024)	(0.030)	(0.022)
STR	-0.007**	-0.005	-0.004	-0.003	-0.007*	-0.003	-0.009**	-0.002
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Constant (%)	0.267	-0147	0.102	0.007	-0.072	-0.221	-0.095	-0.048
(%)	(0.294)	(0.232)	(0.247)	(0.254)	(0.281)	(0.333)	(0.287)	(0.341)
$Wald_1$	0.1066	0.2422	0.4771	0.3840	0.0747	0.3929	0.0397	0.3157
$Wald_2$	0.0226	0.0353	0.0000	0.1266	0.4184	0.0000	0.7335	0.0000
$Wald_3$	0.0345	0.0420	0.0000	0.1412	0.2093	0.0000	0.3956	0.0000
Adjusted R-squared	0.096	0.189	0.254	0.111	0.080	0.152	0.020	0.089
Observations	60	60	60	60	60	60	60	60

Long-short portfolios 50% Cut Off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% long-short portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}$, $\boldsymbol{Wald_2}$, $\boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.062*	-0.006	0.012	0.051	0.010	0.005	0.032	0.007
	(0.033)	(0.042)	(0.024)	(0.046)	(0.021)	(0.038)	(0.027)	(0.037)
SMB	0.025	-0.352***	-0.093*	-0.181	-0.188***	-0.385***	-0.309***	-0.505***
	(0.072)	(0.092)	(0.053)	(0.109)	(0.055)	(0.088)	(0.070)	(0.081)
HML	0.066	-0.007	0.008	0.079	0.035	0.111*	-0.077**	0.035
	(0.054)	(0.068)	(0.040)	(0.074)	(0.045)	(0.062)	(0.038)	(0.060)
MOM	-0.018	0.106**	0.085***	0.099***	-0.029	0.043	0.049**	0.051
	(0.034)	(0.043)	(0.025)	(0.035)	(0.029)	(0.036)	(0.019)	(0.037)
MKTRF_DY	-0.041	-0.201	0.054	0.311	-0.061	-0.153	0.169	0.061
	(0.121)	(0.153)	(0.088)	(0.229)	(0.091)	(0.170)	(0.130)	(0.134)
SMB_DY	0.219	0.093	0.171	0.359	0.222	-0.127	-0.175	-0.422*
	(0.193)	(0.245)	(0.142)	(0.279)	(0.150)	(0.248)	(0.191)	(0.215)
HML_DY	0.329	0.893***	0.053	0.353	0.150	0.674**	0.110	0.495**
	(0.207)	(0.263)	(0.152)	(0.280)	(0.229)	(0.256)	(0.121)	(0.231)
MOM_DY	0.239**	0.601***	-0.191**	0.189	-0.231**	0.233*	-0.149*	0.179
	(0.102)	(0.129)	(0.075)	(0.147)	(0.089)	(0.129)	(0.076)	(0.113)
MKTRF_STR	0.076	0.094	0.032	0.268***	0.082	0.204**	0.100*	0.160**
	(0.056)	(0.071)	(0.041)	(0.095)	(0.049)	(0.085)	(0.050)	(0.063)
SMB_STR	0.188	0.144	0.055	0.458***	0.104	0.122	-0.085	0.039
	(0.119)	(0.151)	(0.087)	(0.158)	(0.064)	(0.134)	(0.091)	(0.133)
HML_STR	0.236*	0.254	0.018	0.274	0.019	0.077	0.109	0.164
	(0.131)	(0.166)	(0.096)	(0.235)	(0.139)	(0.190)	(0.123)	(0.146)
MOM_STR	0.086	0.186**	-0.097**	0.083	-0.091**	0.126	-0.071	0.018
	(0.065)	(0.082)	(0.047)	(0.138)	(0.044)	(0.111)	(0.045)	(0.072)
DY	0.008	0.022***	0.005	0.003	-0.002	0.012	-0.005	0.005
	(0.005)	(0.007)	(0.004)	(0.008)	(0.006)	(0.009)	(0.005)	(0.006)
STR	-0.004	-0.001	0.001	-0.003	-0.002	-0.004	-0.004*	-0.004
	(0.002)	(0.003)	(0.002)	(0.005)	(0.002)	(0.004)	(0.002)	(0.003)
Constant (%)	-0.139	-0.244	-0.187*	-0.246	-0.123	-0.103	-0.173*	-0.164
(%)	(0.129)	(0.164)	(0.095)	(0.190)	(0.088)	(0.162)	(0.090)	(0.144)
$Wald_1$	0.0247	0.0017	0.4389	0.6616	0.6098	0.1108	0.1568	0.0793
$Wald_2$	0.0234	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0139	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.204	0.703	0.386	0.350	0.359	0.498	0.584	0.639
Observations	72	72	72	72	72	72	72	72

Long- Short 50% Cut Off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% long-short portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.116**	0.075	0.070	-0.127	0.047	0.013	0.027	-0.078*
	(0.051)	(0.061)	(0.044)	(0.086)	(0.045)	(0.045)	(0.034)	(0.046)
SMB	-0.054	-0.413***	-0.272***	-0.145**	-0.322***	-0.340***	-0.372***	-0.338***
	(0.055)	(0.060)	(0.048)	(0.062)	(0.049)	(0.049)	(0.042)	(0.050)
HML	0.186***	0.138	-0.124**	-0.038	0.020	-0.014	0.080	0.112*
	(0.069)	(0.087)	(0.061)	(0.048)	(0.062)	(0.062)	(0.062)	(0.063)
MOM	-0.126**	-0.059	-0.107**	-0.079	-0.052	-0.013	-0.119**	-0.075
	(0.055)	(0.059)	(0.048)	(0.063)	(0.049)	(0.049)	(0.048)	(0.050)
MKTRF_DY	-0.728	-0.194	0.112	-0.503	-0.377	-0.445	0.103	-0.169
	(0.489)	(0.506)	(0.431)	(0.542)	(0.440)	(0.437)	(0.345)	(0.443)
SMB_DY	-1.047	-0.199	-0.005	0.641	-0.472	-0.492	-0.837	-0.337
	(0.878)	(0.870)	(0.773)	(0.823)	(0.789)	(0.783)	(0.604)	(0.794)
HML_DY	0.841	0.727	-1.018	-0.192	0.450	0.353	0.478	1.277
	(1.060)	(1.143)	(0.933)	(0.955)	(0.953)	(0.945)	(0.827)	(0.958)
MOM_DY	-0.239	0.671	0.451	1.349***	-0.293	0.068	0.258	0.889
	(0.589)	(0.538)	(0.518)	(0.468)	(0.529)	(0.525)	(0.456)	(0.532)
MKTRF_STR	0.089	0.165	-0.073	0.601**	0.060	0.165	-0.011	0.215
	(0.194)	(0.181)	(0.171)	(0.258)	(0.174)	(0.173)	(0.124)	(0.175)
SMB_STR	-0.469*	-0.968***	-0.595***	-0.486*	-0.270	-0.361*	-0.359**	-0.419*
	(0.240)	(0.227)	(0.211)	(0.276)	(0.216)	(0.214)	(0.162)	(0.217)
HML_STR	-0.761***	-0.576**	-0.626***	-0.258	-0.894***	-0.460*	-0.706***	-0.218
	(0.263)	(0.268)	(0.232)	(0.239)	(0.237)	(0.235)	(0.233)	(0.238)
MOM_STR	-0.367*	-0.048	-0.551***	0.045	-0.635***	-0.030	-0.672***	-0.040
	(0.208)	(0.193)	(0.183)	(0.210)	(0.187)	(0.186)	(0.173)	(0.188)
DY	0.030*	0.033**	0.020	0.028	0.024	0.019	0.015	0.007
	(0.017)	(0.014)	(0.015)	(0.019)	(0.016)	(0.016)	(0.013)	(0.016)
STR	-0.008	-0.001	-0.011**	-0.009	-0.009*	-0.006	-0.006	-0.001
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Constant (%)	-0.244*	-0.207	-0.225*	0.182	-0.268**	-0.079	-0.365***	-0.120
(%)	(0.142)	(0.152)	(0.125)	(0.172)	(0.127)	(0.126)	(0.113)	(0.128)
$Wald_1$	0.0652	0.0809	0.0273	0.1804	0.0470	0.1921	0.2497	0.8844
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.229	0.142	0.1638	0.210	0.281	0.117	0.309	0.317
Observations	72	72	72	72	72	72	72	72

Long-Short 10% Cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% long-short portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1, Wald_2, Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	-0.190	-0.016	-0.045	0.025	-0.163	-0.168	-0.131	0.060
	(0.136)	(0.189)	(0.145)	(0.181)	(0.133)	(0.118)	(0.150)	(0.146)
SMB	-0.141	-0.195	-0.218	-0.266	-0.029	-0.018	-0.138	-0.165
	(0.146)	(0.185)	(0.155)	(0.194)	(0.143)	(0.146)	(0.161)	(0.178)
HML	-0.281	-0.292	-0.023	-0.224	-0.451**	-0.347	-0.203	-0.348
	(0.182)	(0.181)	(0.194)	(0.243)	(0.179)	(0.235)	(0.202)	(0.234)
MOM	0.043	-0.024	-0.041	-0.100	0.028	0.108	0.229*	0.086
	(0.109)	(0.124)	(0.116)	(0.145)	(0.107)	(0.120)	(0.120)	(0.139)
MKTRF_DY	-1.558	-1.623	-1.061	-2.328	-1.247	-4.106**	0.168	-2.218*
	(1.454)	(1.673)	(1.546)	(1.936)	(1.425)	(1.595)	(1.607)	(1.303)
SMB_DY	1.480	-0.323	-1.336	-3.562	-0.933	-1.054	1.621	-2.893
	(2.216)	(2.569)	(2.356)	(2.950)	(2.171)	(2.531)	(2.449)	(2.290)
HML_DY	-0.258	0.491	-3.259	-3.696	-0.126	4.811**	-1.824	-1.332
	(2.192)	(1.550)	(2.331)	(2.918)	(2.148)	(2.349)	(2.423)	(1.756)
MOM_DY	-1.409	-1.139	-1.280	-0.854	1.204	2.188	1.181	1.331
	(1.403)	(1.553)	(1.491)	(1.867)	(1.374)	(1.413)	(1.550)	(1.284)
MKTRF_STR	0.236	0.428*	0.513**	0.487*	-0.082	-0.257	0.078	0.128
	(0.188)	(0.235)	(0.200)	(0.250)	(0.184)	(0.211)	(0.207)	(0.177)
SMB_STR	-0.116	-0.243	-0.140	0.124	0.153	0.157	-0.168	0.057
	(0.247)	(0.246)	(0.262)	(0.328)	(0.242)	(0.222)	(0.273)	(0.243)
HML_STR	0.180	0.169	0.490	0.623	-0.024	-0.672*	0.371	0.265
	(0.348)	(0.338)	(0.370)	(0.463)	(0.340)	(0.400)	(0.384)	(0.438)
MOM_STR	0.115	0.215	0.242*	0.300*	-0.011	0.009	0.217	0.203
	(0.126)	(0.165)	(0.134)	(0.167)	(0.123)	(0.121)	(0.139)	(0.161)
DY	-0.013	0.036	0.033	0.057	0.004	0.074*	-0.039	0.038
	(0.033)	(0.032)	(0.036)	(0.044)	(0.033)	(0.040)	(0.037)	(0.037)
STR	-0.001	-0.002	-0.000	0.001	-0.004	-0.002	-0.010*	-0.002
	(0.005)	(0.006)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.006)
Constant (%)	-0.096	-0.280	-0.296	-0.632	0.483	0.723*	0.162	-0.170
(%)	(0.325)	(0.392)	(0.345)	(0.432)	(0.318)	(0.378)	(0.359)	(0.423)
$Wald_1$	0.8470	0.5083	0.6386	0.3728	0.7111	0.1782	0.0467	0.5598
$Wald_2$	0.1481	0.0259	0.1632	0.2109	0.0438	0.0000	0.0676	0.0000
$Wald_3$	0.2333	0.0050	0.1511	0.1859	0.0236	0.0000	0.0314	0.0000
	-0.096	-0.280	-0.296	-0.632	0.483	0.723*	0.162	-0.170
Adjusted R-squared	0.071	-0.007	0.106	0.090	0.221	0.254	0.156	0.059
Observations	60	60	60	60	60	60	60	60

Long-Short 10% Cut-off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% long-short portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.109	0.216**	0.048	0.045	0.055	0.260***	0.034	0.010
	(0.074)	(0.092)	(0.056)	(0.073)	(0.063)	(0.074)	(0.074)	(0.123)
SMB	-0.205	-0.483***	-0.172	-0.537***	-0.331***	-0.033	-0.468***	-0.227
	(0.130)	(0.146)	(0.124)	(0.161)	(0.120)	(0.163)	(0.144)	(0.201)
HML	-0.362***	-0.113	0.044	0.148	-0.358***	-0.251**	-0.424***	-0.507***
	(0.117)	(0.174)	(0.092)	(0.120)	(0.084)	(0.121)	(0.111)	(0.179)
MOM	-0.062	-0.009	-0.043	-0.009	0.081	-0.061	0.036	0.436***
	(0.078)	(0.069)	(0.058)	(0.075)	(0.050)	(0.076)	(0.062)	(0.102)
MKTRF_DY	-0.528**	-0.396*	-0.147	-0.320	-0.149	-0.304	-0.104	-0.100
	(0.239)	(0.216)	(0.207)	(0.268)	(0.266)	(0.272)	(0.198)	(0.434)
SMB_DY	0.400	-0.465	0.337	-0.163	-0.160	-0.244	-0.134	0.268
	(0.339)	(0.477)	(0.331)	(0.430)	(0.409)	(0.435)	(0.399)	(0.559)
HML_DY	0.196	0.565	0.653*	0.766	0.119	0.160	0.375	0.765
	(0.418)	(0.390)	(0.356)	(0.462)	(0.334)	(0.467)	(0.391)	(0.612)
MOM_DY	-0.690***	-0.152	-0.154	0.033	-0.538***	-0.038	-0.392***	0.658**
	(0.237)	(0.163)	(0.174)	(0.226)	(0.151)	(0.229)	(0.146)	(0.272)
MKTRF_STR	0.008	0.104	-0.013	-0.156	-0.174	-0.114	-0.016	0.090
	(0.089)	(0.137)	(0.096)	(0.125)	(0.112)	(0.127)	(0.102)	(0.156)
SMB_STR	0.166	-0.007	0.414**	0.343	-0.117	0.405	0.131	-0.148
	(0.184)	(0.236)	(0.204)	(0.265)	(0.158)	(0.268)	(0.200)	(0.306)
HML_STR	-0.016	0.155	0.108	0.017	0.132	0.337	0.239	0.633
	(0.263)	(0.295)	(0.225)	(0.292)	(0.158)	(0.295)	(0.268)	(0.523)
MOM_STR	-0.490***	-0.150	-0.261**	-0.105	-0.368***	0.053	-0.294***	0.351*
	(0.145)	(0.119)	(0.111)	(0.144)	(0.091)	(0.146)	(0.092)	(0.193)
DY	-0.011	0.001	0.001	0.015	-0.010	0.001	-0.011	0.017
	(0.011)	(0.011)	(0.009)	(0.012)	(0.009)	(0.012)	(0.011)	(0.019)
STR	0.002	-0.006	0.005	0.005	0.001	-0.012**	-0.001	0.001
	(0.004)	(0.006)	(0.004)	(0.005)	(0.003)	(0.006)	(0.004)	(0.008)
Constant (%)	-0.579**	-0.318	-0.254	-0.047	-0.386**	-0.008	-0.508**	-0.874**
(%)	(0.232)	(0.249)	(0.222)	(0.288)	(0.171)	(0.291)	(0.229)	(0.345)
$Wald_1$	0.4068	0.4255	0.4996	0.4239	0.3202	0.0687	0.5860	0.6688
$Wald_2$	0.0000	0.0018	0.0091	0.0031	0.0000	0.0018	0.0000	0.0000
$Wald_3$	0.0000	0.0003	0.0141	0.0037	0.0000	0.0016	0.0000	0.0000
Adjusted R-squared	0.408	0.194	0.204	0.256	0.613	0.285	0.573	0.645
Observations	72	72	72	72	72	72	72	72

Long-Short 10% Cut Off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% long-short portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.053	-0.020	0.083	-0.007	0.134**	0.116	-0.300***	-0.333*
	(0.079)	(0.071)	(0.057)	(0.067)	(0.064)	(0.097)	(0.107)	(0.172)
SMB	-0.645***	-0.334***	-0.367***	-0.301***	-0.568***	-0.176**	-0.604***	-0.378***
	(0.089)	(0.087)	(0.062)	(0.072)	(0.069)	(0.079)	(0.116)	(0.105)
HML	-0.465***	-0.261**	-0.240***	-0.041	-0.183**	-0.316**	-0.440***	-0.253**
	(0.131)	(0.119)	(0.079)	(0.091)	(0.088)	(0.139)	(0.147)	(0.096)
MOM	-0.314***	-0.202**	-0.092	-0.023	-0.095	-0.197*	-0.336***	-0.287***
	(0.103)	(0.083)	(0.062)	(0.072)	(0.070)	(0.107)	(0.117)	(0.097)
MKTRF_DY	-0.341	0.987	-0.286	0.385	-1.191*	0.266	1.851*	2.789**
	(0.752)	(0.608)	(0.556)	(0.645)	(0.620)	(0.712)	(1.038)	(1.319)
SMB_DY	0.084	1.875	-0.672	-0.154	-0.628	-0.760	-0.544	-1.628
	(1.418)	(1.427)	(0.997)	(1.156)	(1.112)	(1.192)	(1.862)	(1.730)
HML_DY	0.898	1.551	-1.687	-0.334	1.107	-0.931	1.192	0.164
	(1.711)	(1.846)	(1.204)	(1.396)	(1.342)	(1.761)	(2.248)	(1.566)
MOM_DY	0.394	2.620***	0.004	1.251	-1.441*	-0.352	1.287	1.937*
	(0.930)	(0.742)	(0.669)	(0.775)	(0.745)	(0.980)	(1.248)	(1.096)
MKTRF_STR	-0.042	0.040	0.277	0.262	-0.028	-0.132	1.016**	0.957*
	(0.248)	(0.255)	(0.220)	(0.255)	(0.246)	(0.346)	(0.411)	(0.486)
SMB_STR	-1.315***	-0.464	-0.762***	0.186	-0.313	-0.507	-1.059**	-0.412
	(0.298)	(0.370)	(0.272)	(0.316)	(0.304)	(0.394)	(0.509)	(0.495)
HML_STR	-0.787*	0.100	-0.271	0.119	-1.302***	-1.184***	-0.577	0.232
	(0.415)	(0.418)	(0.299)	(0.347)	(0.334)	(0.378)	(0.559)	(0.416)
MOM_STR	-0.556*	0.363	-0.075	0.569**	-0.676**	-0.572	-0.008	0.693**
	(0.308)	(0.253)	(0.237)	(0.274)	(0.264)	(0.350)	(0.442)	(0.335)
DY	0.033	0.044*	0.018	0.049**	-0.002	0.003	-0.037	-0.043
	(0.028)	(0.026)	(0.020)	(0.023)	(0.022)	(0.024)	(0.037)	(0.045)
STR	-0.010	-0.002	-0.006	-0.004	-0.010	-0.009	-0.026**	-0.020*
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.008)	(0.011)	(0.011)
Constant (%)	-0.476*	-0.136	0.015	-0.034	-0.352*	-0.366	0.274	0.276
(%)	(0.241)	(0.250)	(0.161)	(0.187)	(0.180)	(0.255)	(0.301)	(0.341)
$Wald_1$	0.2290	0.2396	0.4001	0.0884	0.3511	0.5342	0.0507	0.2008
$Wald_2$	0.0000	0.0000	0.0000	0.0036	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0040	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.565	0.295	0.414	0.253	0.535	0.167	0.406	0.258
Observations	72	72	72	72	72	72	72	72

High-Rated 50% Cut-Off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% high-rated portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $\boldsymbol{Wald_1}, \boldsymbol{Wald_2}, \boldsymbol{Wald_3}$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.007***	0.998***	0.997***	1.001***	1.030***	1.010***	1.052***	0.994***
	(0.064)	(0.043)	(0.060)	(0.046)	(0.039)	(0.035)	(0.040)	(0.052)
SMB	0.185**	-0.315***	0.141**	-0.302***	0.183***	-0.268***	0.159***	-0.198***
	(0.077)	(0.046)	(0.065)	(0.049)	(0.054)	(0.038)	(0.058)	(0.056)
HML	0.109	-0.047	0.059	-0.099	0.024	-0.102**	0.060	0.003
	(0.067)	(0.057)	(0.081)	(0.061)	(0.064)	(0.047)	(0.071)	(0.070)
MOM	-0.031	-0.043	-0.079	-0.073*	-0.012	-0.050*	-0.003	-0.026
	(0.061)	(0.034)	(0.048)	(0.037)	(0.046)	(0.028)	(0.047)	(0.042)
MKTRF_DY	-0.386	-0.291	0.222	0.106	0.128	0.031	0.010	-0.436
	(0.593)	(0.455)	(0.646)	(0.489)	(0.555)	(0.377)	(0.574)	(0.560)
SMB_DY	2.194**	-1.166*	3.186***	-1.280*	1.589	-1.454**	1.500	-0.581
	(0.956)	(0.693)	(0.985)	(0.745)	(1.186)	(0.574)	(1.229)	(0.853)
HML_DY	1.382*	-0.889	2.573**	-0.206	1.024	-0.824	1.087*	0.146
	(0.718)	(0.685)	(0.974)	(0.737)	(0.701)	(0.568)	(0.626)	(0.844)
MOM_DY	-0.300	0.199	-0.898	-0.000	0.675	0.598	0.525	0.245
	(0.582)	(0.439)	(0.624)	(0.472)	(0.476)	(0.363)	(0.479)	(0.540)
MKTRF_STR	-0.009	0.079	-0.013	0.123*	-0.006	0.104**	0.030	0.118
	(0.077)	(0.059)	(0.083)	(0.063)	(0.067)	(0.049)	(0.065)	(0.072)
SMB_STR	-0.076	0.067	-0.047	0.080	-0.002	0.071	-0.027	0.144
	(0.113)	(0.077)	(0.110)	(0.083)	(0.080)	(0.064)	(0.089)	(0.095)
HML_STR	0.006	0.095	-0.217	0.012	-0.091	0.046	0.007	0.224
	(0.164)	(0.109)	(0.154)	(0.117)	(0.160)	(0.090)	(0.170)	(0.134)
MOM_STR	0.056	0.038	-0.006	0.008	0.022	0.003	0.040	0.017
	(0.046)	(0.039)	(0.056)	(0.042)	(0.032)	(0.033)	(0.030)	(0.048)
DY	-0.006	0.010	-0.009	0.010	-0.013	0.007	-0.015	0.009
	(0.010)	(0.010)	(0.015)	(0.011)	(0.010)	(0.009)	(0.010)	(0.013)
STR	-0.002	-0.000	-0.000	0.000	-0.001	0.000	-0.002	0.002
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Constant (%)	0.584***	0.170	0.667***	0.180	0.579***	0.154*	0.552***	0.277**
(%)	(0.135)	(0.101)	(0.144)	(0.109)	(0.126)	(0.084)	(0.127)	(0.125)
$Wald_1$	0.3705	0.6517	0.7762	0.5759	0.2989	0.5837	0.1138	0.2137
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.941	0.945	0.940	0.940	0.940	0.963	0.937	0.919
Observations	60	60	60	60	60	60	60	60

High-Rated 50%Cut-Off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% high-rated portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.078***	1.010***	1.069***	1.004***	1.070***	1.018***	1.079***	1.008***
	(0.025)	(0.014)	(0.027)	(0.015)	(0.026)	(0.016)	(0.025)	(0.013)
SMB	0.184***	-0.193***	0.262***	-0.187***	0.208***	-0.165***	0.152***	-0.204***
	(0.056)	(0.030)	(0.059)	(0.033)	(0.071)	(0.035)	(0.055)	(0.028)
HML	0.112***	0.039*	0.134***	0.048*	0.144***	0.052*	0.090**	0.037*
	(0.042)	(0.022)	(0.044)	(0.024)	(0.047)	(0.026)	(0.041)	(0.021)
MOM	-0.103***	0.020	-0.086***	0.019	-0.148***	0.018	-0.107***	0.015
	(0.026)	(0.014)	(0.028)	(0.015)	(0.040)	(0.016)	(0.026)	(0.013)
MKTRF_DY	0.215**	0.056	0.198*	0.053	0.132	0.099*	0.246***	0.083*
	(0.093)	(0.050)	(0.099)	(0.054)	(0.128)	(0.059)	(0.092)	(0.047)
SMB_DY	0.225	0.100	0.347**	0.135	0.358*	0.187*	0.164	0.078
	(0.150)	(0.080)	(0.159)	(0.087)	(0.199)	(0.094)	(0.147)	(0.076)
HML_DY	-0.552***	0.012	-0.631***	-0.010	-0.580***	0.025	-0.593***	-0.009
	(0.161)	(0.086)	(0.170)	(0.094)	(0.166)	(0.101)	(0.158)	(0.081)
MOM_DY	-0.369***	-0.007	-0.428***	-0.055	-0.454***	0.018	-0.407***	-0.022
	(0.079)	(0.042)	(0.083)	(0.046)	(0.122)	(0.050)	(0.077)	(0.040)
MKTRF_STR	0.006	0.023	-0.027	0.017	-0.003	0.066**	0.007	0.029
	(0.044)	(0.023)	(0.046)	(0.025)	(0.036)	(0.027)	(0.043)	(0.022)
SMB_STR	0.083	0.039	0.116	0.081	0.150**	0.061	0.045	0.027
	(0.092)	(0.049)	(0.098)	(0.054)	(0.071)	(0.058)	(0.091)	(0.046)
HML_STR	-0.067	-0.048	-0.116	-0.048	-0.115	-0.045	-0.070	-0.054
	(0.102)	(0.055)	(0.108)	(0.059)	(0.127)	(0.064)	(0.100)	(0.051)
MOM_STR	-0.088*	0.012	-0.111**	-0.017	-0.117**	0.028	-0.104**	-0.012
	(0.050)	(0.027)	(0.053)	(0.029)	(0.053)	(0.032)	(0.049)	(0.025)
DY	-0.012***	0.002	-0.012***	0.001	-0.015***	0.000	-0.016***	-0.000
	(0.004)	(0.002)	(0.004)	(0.002)	(0.005)	(0.003)	(0.004)	(0.002)
STR	-0.006***	-0.003***	-0.004**	-0.002**	-0.005***	-0.003***	-0.006***	-0.003***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Constant (%)	0.064	-0.042	0.068	-0.052	0.078	-0.049	0.067	-0.039
(%)	(0.100)	(0.054)	(0.106)	(0.058)	(0.109)	(0.063)	(0.099)	(0.051)
$Wald_1$	0.0046	0.0020	0.0213	0.0573	0.0008	0.0104	0.0003	0.0044
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.987	0.994	0.971	0.993	0.984	0.992	0.987	0.995
Observations	72	72	72	72	72	72	72	72

High-Rated 50%Cut-off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% high-rated portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.030***	0.988***	1.038***	0.805***	1.028***	0.968***	1.016***	0.957***
	(0.033)	(0.026)	(0.034)	(0.044)	(0.033)	(0.014)	(0.033)	(0.025)
SMB	0.272***	-0.087***	0.318***	0.017	0.299***	-0.095***	0.260***	-0.085***
	(0.035)	(0.028)	(0.037)	(0.047)	(0.035)	(0.015)	(0.035)	(0.027)
HML	0.110**	0.061*	0.018	-0.011	0.091**	-0.002	0.127***	0.054
	(0.045)	(0.036)	(0.046)	(0.060)	(0.045)	(0.019)	(0.045)	(0.034)
MOM	-0.156***	-0.089***	-0.164***	-0.077	-0.134***	-0.052***	-0.170***	-0.029
	(0.035)	(0.028)	(0.037)	(0.047)	(0.035)	(0.015)	(0.035)	(0.027)
MKTRF_DY	-0.069	0.465*	0.053	-0.453	-0.218	0.109	-0.001	0.263
	(0.315)	(0.251)	(0.328)	(0.422)	(0.316)	(0.132)	(0.315)	(0.241)
SMB_DY	-0.405	0.443	-0.032	1.102	-0.335	-0.078	-0.465	-0.035
	(0.566)	(0.451)	(0.588)	(0.758)	(0.566)	(0.236)	(0.566)	(0.433)
HML_DY	0.185	0.071	-0.679	-0.403	-0.005	-0.319	0.086	0.647
	(0.683)	(0.544)	(0.710)	(0.915)	(0.683)	(0.285)	(0.683)	(0.522)
MOM_DY	-0.220	0.690**	-0.025	0.629	-0.444	0.169	-0.186	0.496*
	(0.379)	(0.302)	(0.394)	(0.508)	(0.379)	(0.158)	(0.379)	(0.290)
MKTRF_STR	-0.081	-0.006	-0.112	0.516***	-0.045	0.037	-0.076	0.013
	(0.125)	(0.100)	(0.130)	(0.167)	(0.125)	(0.052)	(0.125)	(0.096)
SMB_STR	0.588***	0.089	0.481***	-0.137	0.695***	0.155**	0.590***	0.126
	(0.154)	(0.123)	(0.161)	(0.207)	(0.155)	(0.064)	(0.155)	(0.118)
HML_STR	-0.390**	-0.205	-0.316*	-0.009	-0.413**	0.013	-0.362**	0.067
	(0.170)	(0.135)	(0.176)	(0.227)	(0.170)	(0.071)	(0.170)	(0.130)
MOM_STR	-0.273**	0.047	-0.202	-0.043	-0.212	0.021	-0.273**	0.024
	(0.134)	(0.107)	(0.139)	(0.180)	(0.134)	(0.056)	(0.134)	(0.103)
DY	0.012	0.014	0.007	0.010	0.008	0.002	0.008	-0.001
	(0.011)	(0.009)	(0.012)	(0.015)	(0.011)	(0.005)	(0.011)	(0.009)
STR	-0.003	0.004	-0.004	-0.008*	-0.002	-0.001	-0.002	0.003
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.001)	(0.003)	(0.003)
Constant (%)	-0.103	-0.066	-0.069	0.296**	-0.072	0.016	-0.143	-0.033
(%)	(0.091)	(0.073)	(0.095)	(0.122)	(0.091)	(0.038)	(0.091)	(0.070)
$Wald_1$	0.3953	0.1310	0.4734	0.1653	0.6510	0.7798	0.6958	0.5137
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.973	0.977	0.972	0.910	0.973	0.993	0.972	0.974
Observations	72	72	72	72	72	72	72	72

High-Rated 30% Cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% high-rated portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.021***	0.996***	0.963***	0.814***	1.048***	1.050***	1.047***	1.046***
	(0.055)	(0.066)	(0.055)	(0.059)	(0.056)	(0.052)	(0.060)	(0.059)
SMB	-0.011	-0.296***	0.134**	-0.292***	0.048	-0.397***	-0.030	-0.396***
	(0.057)	(0.071)	(0.059)	(0.063)	(0.065)	(0.052)	(0.065)	(0.063)
HML	0.047	-0.161*	-0.026	-0.047	0.068	-0.092	0.124*	-0.055
	(0.065)	(0.089)	(0.073)	(0.079)	(0.073)	(0.069)	(0.066)	(0.079)
MOM	-0.038	-0.008	-0.090**	-0.062	-0.044	-0.024	-0.055	-0.044
	(0.051)	(0.053)	(0.044)	(0.047)	(0.057)	(0.053)	(0.056)	(0.047)
MKTRF_DY	0.584	-0.183	-0.631	-1.078*	-0.105	0.030	0.539	-0.159
	(0.563)	(0.707)	(0.585)	(0.630)	(0.585)	(0.451)	(0.592)	(0.633)
SMB_DY	-0.239	-1.727	1.935**	-1.158	0.565	-2.329***	-0.036	-1.663*
	(1.284)	(1.077)	(0.891)	(0.961)	(1.081)	(0.626)	(1.147)	(0.964)
HML_DY	-0.678	-1.427	1.188	-0.047	-0.175	-1.191**	-0.173	-1.294
	(0.636)	(1.066)	(0.881)	(0.950)	(0.612)	(0.518)	(0.770)	(0.954)
MOM_DY	1.350**	0.578	0.468	-0.129	0.109	0.312	1.202**	0.556
	(0.505)	(0.682)	(0.564)	(0.608)	(0.506)	(0.567)	(0.541)	(0.610)
MKTRF_STR	0.062	0.042	0.027	-0.109	0.062	0.160**	0.039	0.146*
	(0.073)	(0.091)	(0.075)	(0.081)	(0.085)	(0.062)	(0.077)	(0.082)
SMB_STR	0.031	0.176	0.029	0.217**	-0.089	-0.003	0.082	0.077
	(0.093)	(0.120)	(0.099)	(0.107)	(0.101)	(0.082)	(0.089)	(0.107)
HML_STR	0.038	0.079	-0.024	0.003	-0.014	0.099	0.082	0.129
	(0.149)	(0.169)	(0.140)	(0.151)	(0.177)	(0.152)	(0.161)	(0.151)
MOM_STR	0.067	0.097	0.019	0.026	0.015	0.041	0.064	0.052
	(0.042)	(0.061)	(0.051)	(0.055)	(0.052)	(0.064)	(0.043)	(0.055)
DY	-0.019*	0.003	0.001	0.029*	-0.006	0.009	-0.026**	0.006
	(0.010)	(0.016)	(0.013)	(0.014)	(0.013)	(0.013)	(0.012)	(0.015)
STR	-0.001	0.000	-0.001	-0.000	-0.001	0.001	-0.002	-0.000
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Constant (%)	0.439***	0.188	0.592***	0.303**	0.430***	0.106	0.463***	0.123
(%)	(0.135)	(0.158)	(0.130)	(0.141)	(0.150)	(0.148)	(0.135)	(0.141)
$Wald_1$	0.0966	0.9438	0.9288	0.1355	0.6753	0.6786	0.0108	0.9267
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.928	0.878	0.937	0.873	0.925	0.923	0.922	0.898
Observations	60	60	60	60	60	60	60	60

High-Rated 30% Cut-off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% high-rated portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.062***	0.985***	1.088***	0.912***	1.046***	0.983***	1.047***	0.975***
	(0.024)	(0.019)	(0.031)	(0.040)	(0.022)	(0.020)	(0.024)	(0.020)
SMB	0.099*	-0.253***	0.233***	-0.049	0.143***	-0.247***	0.049	-0.260***
	(0.053)	(0.042)	(0.069)	(0.077)	(0.049)	(0.043)	(0.041)	(0.044)
HML	0.148***	0.064**	0.129**	-0.054	0.176***	0.062*	0.096**	0.047
	(0.039)	(0.031)	(0.051)	(0.054)	(0.036)	(0.032)	(0.044)	(0.033)
MOM	-0.104***	0.016	-0.119***	0.105***	-0.095***	0.026	-0.073***	0.027
	(0.025)	(0.019)	(0.032)	(0.039)	(0.023)	(0.020)	(0.018)	(0.020)
MKTRF_DY	0.222**	0.005	0.235**	-0.014	0.146*	-0.051	0.143	-0.020
	(0.088)	(0.069)	(0.114)	(0.183)	(0.081)	(0.072)	(0.093)	(0.074)
SMB_DY	0.242*	0.088	0.297	0.318	0.307**	0.071	0.127	0.074
	(0.141)	(0.111)	(0.184)	(0.222)	(0.130)	(0.115)	(0.108)	(0.118)
HML_DY	-0.482***	0.103	-0.519**	-0.199	-0.460***	0.093	-0.311**	0.132
	(0.151)	(0.119)	(0.197)	(0.237)	(0.140)	(0.123)	(0.148)	(0.127)
MOM_DY	-0.388***	-0.016	-0.402***	0.093	-0.314***	0.020	-0.281***	0.019
	(0.074)	(0.059)	(0.097)	(0.099)	(0.069)	(0.061)	(0.073)	(0.062)
MKTRF_STR	0.018	0.028	0.017	0.010	0.006	0.016	0.024	0.032
	(0.041)	(0.032)	(0.053)	(0.064)	(0.038)	(0.033)	(0.037)	(0.034)
SMB_STR	0.138	0.075	0.165	0.066	0.112	0.014	-0.003	0.015
	(0.087)	(0.068)	(0.113)	(0.132)	(0.080)	(0.071)	(0.049)	(0.073)
HML_STR	-0.067	-0.058	-0.094	0.014	-0.143	-0.132*	0.009	-0.027
	(0.096)	(0.075)	(0.124)	(0.167)	(0.088)	(0.078)	(0.122)	(0.080)
MOM_STR	-0.111**	-0.002	-0.132**	0.077	-0.034	0.043	-0.056	0.022
	(0.047)	(0.037)	(0.061)	(0.078)	(0.044)	(0.039)	(0.042)	(0.039)
DY	-0.014***	0.003	-0.010**	0.012*	-0.008**	0.006*	-0.013***	0.002
	(0.004)	(0.003)	(0.005)	(0.007)	(0.004)	(0.003)	(0.004)	(0.003)
STR	-0.006***	-0.002	-0.004	0.003	-0.005***	-0.002	-0.006***	-0.002
	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)
Constant (%)	0.054	-0.029	-0.030	-0.281**	0.141	0.009	0.055	-0.035
(%)	(0.094)	(0.074)	(0.123)	(0.128)	(0.087)	(0.077)	(0.103)	(0.079)
$Wald_1$	0.0010	0.0590	0.1054	0.0876	0.0090	0.0256	0.0023	0.0940
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.988	0.988	0.982	0.941	0.990	0.987	0.986	0.985
Observations	72	72	72	72	72	72	72	72

High-Rated 30% Cut-off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% high-rated portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.038***	1.056***	1.064***	0.915***	1.026***	1.031***	0.993***	0.966***
	(0.032)	(0.039)	(0.036)	(0.039)	(0.036)	(0.021)	(0.034)	(0.016)
SMB	0.146***	-0.104**	0.220***	-0.119***	0.159***	-0.182***	0.149***	-0.150***
	(0.035)	(0.042)	(0.039)	(0.042)	(0.039)	(0.023)	(0.036)	(0.018)
HML	0.092**	0.036	0.099**	0.057	0.061	0.023	0.090*	0.031
	(0.044)	(0.053)	(0.050)	(0.053)	(0.049)	(0.029)	(0.046)	(0.022)
MOM	-0.180***	-0.149***	-0.146***	-0.034	-0.192***	-0.055**	-0.184***	-0.061***
	(0.035)	(0.042)	(0.039)	(0.042)	(0.039)	(0.023)	(0.037)	(0.018)
MKTRF_DY	-0.082	0.215	-0.274	0.517	-0.160	0.198	0.091	0.179
	(0.313)	(0.376)	(0.350)	(0.378)	(0.345)	(0.202)	(0.325)	(0.157)
SMB_DY	-0.315	-0.011	-0.038	0.331	-0.098	-0.202	-0.274	0.133
	(0.561)	(0.674)	(0.628)	(0.677)	(0.619)	(0.362)	(0.583)	(0.282)
HML_DY	0.014	-0.470	0.064	-0.089	-0.061	-0.312	0.119	-0.038
	(0.677)	(0.813)	(0.759)	(0.818)	(0.747)	(0.437)	(0.704)	(0.341)
MOM_DY	-0.231	0.308	-0.442	0.507	-0.259	0.343	-0.007	0.385**
	(0.376)	(0.452)	(0.421)	(0.454)	(0.415)	(0.243)	(0.391)	(0.189)
MKTRF_STR	-0.129	-0.120	-0.204	-0.063	-0.120	-0.087	-0.045	0.003
	(0.124)	(0.149)	(0.139)	(0.150)	(0.137)	(0.080)	(0.129)	(0.062)
SMB_STR	0.349**	0.417**	0.443**	0.095	0.415**	0.232**	0.396**	0.203**
	(0.153)	(0.184)	(0.172)	(0.185)	(0.169)	(0.099)	(0.159)	(0.077)
HML_STR	-0.520***	-0.493**	-0.481**	-0.111	-0.457**	0.097	-0.342*	0.052
	(0.168)	(0.202)	(0.189)	(0.203)	(0.186)	(0.109)	(0.175)	(0.085)
MOM_STR	-0.423***	-0.488***	-0.308**	0.146	-0.379**	0.032	-0.311**	0.057
	(0.133)	(0.160)	(0.149)	(0.161)	(0.147)	(0.086)	(0.138)	(0.067)
DY	0.012	0.003	0.017	0.028**	0.012	-0.001	0.011	0.005
	(0.011)	(0.013)	(0.012)	(0.013)	(0.012)	(0.007)	(0.012)	(0.006)
STR	-0.003	-0.006	-0.002	-0.005	-0.003	0.003	-0.003	0.000
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.003)	(0.002)
Constant (%)	-0.117	-0.158	-0.122	-0.218*	-0.146	0.028	-0.059	0.027
(%)	(0.091)	(0.109)	(0.101)	(0.109)	(0.100)	(0.058)	(0.094)	(0.046)
$Wald_1$	0.3421	0.2913	0.3338	0.0402	0.4144	0.3701	0.4168	0.6734
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.972	0.956	0.967	0.940	0.966	0.984	0.968	0.989
Observations	72	72	72	72	72	72	72	72

High-Rated 10% Cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% high-rated portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.955***	1.003***	1.005***	0.976***	0.928***	0.907***	0.925***	1.057***
	(0.044)	(0.077)	(0.070)	(0.077)	(0.065)	(0.064)	(0.070)	(0.067)
SMB	-0.122*	-0.359***	-0.091	-0.349***	-0.077	-0.184**	-0.060	-0.252***
	(0.062)	(0.082)	(0.074)	(0.083)	(0.070)	(0.074)	(0.070)	(0.077)
HML	-0.117*	-0.211**	-0.167*	-0.277**	-0.067	-0.075	0.127	-0.224
	(0.064)	(0.103)	(0.093)	(0.103)	(0.087)	(0.133)	(0.084)	(0.151)
MOM	-0.091	-0.138**	-0.026	-0.082	-0.100*	0.015	0.000	-0.065
	(0.056)	(0.062)	(0.056)	(0.062)	(0.052)	(0.052)	(0.080)	(0.087)
MKTRF_DY	-1.191	-1.749**	-0.466	-1.693**	-1.318*	-3.607***	-0.785	-2.077***
	(0.725)	(0.823)	(0.744)	(0.825)	(0.695)	(1.245)	(0.943)	(0.675)
SMB_DY	0.077	-2.128*	-0.103	-1.819	-0.485	0.612	-0.356	-2.408*
	(1.051)	(1.254)	(1.133)	(1.257)	(1.060)	(1.623)	(1.273)	(1.398)
HML_DY	0.598	-1.264	0.685	-2.609**	0.870	4.305**	0.124	-0.310
	(0.935)	(1.240)	(1.121)	(1.243)	(1.048)	(1.808)	(1.165)	(0.882)
MOM_DY	0.234	-0.258	0.214	-0.767	0.302	-0.006	1.087	-0.436
	(0.621)	(0.793)	(0.717)	(0.796)	(0.671)	(1.084)	(0.781)	(0.987)
MKTRF_STR	0.116*	0.212*	0.116	0.241**	0.066	-0.051	0.031	0.188***
	(0.065)	(0.106)	(0.096)	(0.106)	(0.090)	(0.131)	(0.088)	(0.060)
SMB_STR	0.086	0.113	0.084	0.064	0.110	0.024	0.086	-0.000
	(0.148)	(0.140)	(0.126)	(0.140)	(0.118)	(0.141)	(0.134)	(0.140)
HML_STR	-0.080	0.117	-0.037	0.186	-0.106	-0.404	0.137	0.263
	(0.124)	(0.197)	(0.178)	(0.197)	(0.166)	(0.243)	(0.159)	(0.246)
MOM_STR	0.029	0.003	0.063	-0.003	0.031	-0.030	0.093	0.052
	(0.050)	(0.071)	(0.064)	(0.071)	(0.060)	(0.053)	(0.071)	(0.076)
DY	0.002	0.015	-0.019	0.006	0.022	0.040	0.016	0.030
	(0.014)	(0.019)	(0.017)	(0.019)	(0.016)	(0.025)	(0.015)	(0.028)
STR	-0.001	0.002	-0.000	0.003	-0.001	0.000	-0.002	0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Constant (%)	0.588***	0.075	0.634***	0.039	0.694***	0.826***	0.567***	0.070
(%)	(0.129)	(0.184)	(0.166)	(0.184)	(0.155)	(0.265)	(0.157)	(0.236)
$Wald_1$	0.8912	0.3584	0.5161	0.3154	0.3897	0.3086	0.3715	0.3190
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.903	0.832	0.886	0.819	0.888	0.752	0.819	0.756
Observations	60	60	60	60	60	60	60	60

High-Rated 10% Cut-off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% high-rated portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.069***	0.965***	1.134***	1.027***	1.021***	1.068***	1.003***	0.940***
	(0.028)	(0.030)	(0.035)	(0.028)	(0.030)	(0.062)	(0.032)	(0.038)
SMB	0.087	-0.323***	0.178**	-0.299***	0.082	0.047	-0.020	-0.341***
	(0.061)	(0.067)	(0.071)	(0.087)	(0.065)	(0.117)	(0.070)	(0.085)
HML	0.086*	0.072	0.132**	0.092	0.097**	0.105	0.125**	0.089
	(0.045)	(0.050)	(0.060)	(0.058)	(0.048)	(0.144)	(0.052)	(0.063)
MOM	-0.089***	0.062*	-0.126***	0.007	-0.062**	-0.134*	-0.073**	0.029
	(0.028)	(0.031)	(0.028)	(0.027)	(0.030)	(0.069)	(0.032)	(0.039)
MKTRF_DY	-0.005	-0.079	0.191**	-0.012	0.082	-0.066	0.002	0.047
	(0.101)	(0.112)	(0.088)	(0.096)	(0.108)	(0.284)	(0.116)	(0.141)
SMB_DY	0.243	0.067	0.468**	0.081	-0.004	-0.035	0.073	-0.354
	(0.162)	(0.180)	(0.188)	(0.261)	(0.174)	(0.327)	(0.187)	(0.226)
HML_DY	-0.138	0.089	-0.309*	0.046	-0.066	-0.222	-0.107	0.051
	(0.174)	(0.193)	(0.170)	(0.225)	(0.187)	(0.538)	(0.200)	(0.243)
MOM_DY	-0.230***	0.004	-0.326***	-0.043	-0.052	-0.039	-0.174*	0.007
	(0.085)	(0.094)	(0.113)	(0.088)	(0.091)	(0.220)	(0.098)	(0.119)
MKTRF_STR	0.076	0.028	0.024	0.042	0.001	-0.115	-0.004	-0.001
	(0.047)	(0.052)	(0.053)	(0.048)	(0.050)	(0.108)	(0.054)	(0.066)
SMB_STR	0.071	0.054	0.302**	-0.038	-0.114	0.534***	0.094	-0.108
	(0.100)	(0.110)	(0.114)	(0.121)	(0.107)	(0.140)	(0.115)	(0.139)
HML_STR	-0.032	-0.094	0.033	-0.172	0.026	-0.098	0.021	-0.118
	(0.110)	(0.122)	(0.128)	(0.172)	(0.118)	(0.217)	(0.127)	(0.154)
MOM_STR	-0.010	0.008	-0.172**	-0.069	0.080	0.097	-0.001	0.068
	(0.054)	(0.060)	(0.067)	(0.063)	(0.058)	(0.089)	(0.062)	(0.076)
DY	-0.006	0.006	-0.010**	0.004	-0.002	0.007	-0.008	0.001
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.008)	(0.005)	(0.006)
STR	-0.002	-0.000	-0.003	0.001	-0.003	-0.009***	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Constant (%)	-0.085	-0.079	-0.011	-0.135	0.048	0.356	-0.032	-0.025
(%)	(0.108)	(0.120)	(0.129)	(0.119)	(0.116)	(0.234)	(0.125)	(0.151)
$Wald_1$	0.3894	0.3765	0.1065	0.7638	0.3957	0.0018	0.3148	0.8787
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.983	0.964	0.972	0.959	0.978	0.924	0.974	0.947
Observations	72	72	72	72	72	72	72	72

High-Rated 10% Cut-off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% high-rated portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.076***	0.988***	1.083***	0.923***	1.042***	1.089***	0.633***	0.621***
	(0.043)	(0.039)	(0.040)	(0.039)	(0.044)	(0.083)	(0.170)	(0.171)
SMB	0.004	-0.219***	0.088*	-0.210***	-0.001	-0.021	-0.073	-0.258**
	(0.046)	(0.037)	(0.048)	(0.042)	(0.048)	(0.081)	(0.098)	(0.102)
HML	0.022	0.058	0.050	0.054	0.001	-0.110	-0.049	-0.079
	(0.059)	(0.053)	(0.072)	(0.053)	(0.060)	(0.121)	(0.092)	(0.089)
MOM	-0.194***	-0.072*	-0.198***	-0.056	-0.152***	-0.157	-0.307***	-0.186**
	(0.047)	(0.042)	(0.053)	(0.042)	(0.048)	(0.100)	(0.114)	(0.089)
MKTRF_DY	-0.123	0.702**	-0.363	0.621	-0.432	-0.088	2.419*	2.822**
	(0.416)	(0.342)	(0.456)	(0.374)	(0.425)	(0.642)	(1.392)	(1.302)
SMB_DY	-0.084	0.426	-0.412	0.472	-0.182	-0.912	-0.498	-1.099
	(0.745)	(0.577)	(0.720)	(0.671)	(0.762)	(1.106)	(1.617)	(1.566)
HML_DY	-0.145	0.033	-0.061	-0.393	-0.497	-2.335	-0.003	-0.889
	(0.900)	(1.108)	(0.870)	(0.810)	(0.920)	(1.480)	(1.222)	(1.235)
MOM_DY	-0.072	1.152***	-0.332	0.955**	-0.237	-0.711	1.123	1.432*
	(0.500)	(0.344)	(0.539)	(0.450)	(0.511)	(0.859)	(0.946)	(0.845)
MKTRF_STR	-0.033	0.010	0.008	0.049	-0.125	-0.316	0.938*	0.891*
	(0.165)	(0.127)	(0.151)	(0.148)	(0.168)	(0.297)	(0.495)	(0.506)
SMB_STR	-0.017	0.149	-0.062	0.141	0.080	0.071	-0.155	-0.208
	(0.204)	(0.145)	(0.195)	(0.183)	(0.208)	(0.390)	(0.415)	(0.415)
HML_STR	-0.338	0.212	-0.338	0.043	-0.580**	-0.814**	-0.116	0.349
	(0.224)	(0.140)	(0.259)	(0.201)	(0.229)	(0.342)	(0.313)	(0.288)
MOM_STR	-0.214	0.212*	-0.183	0.268*	-0.537***	-0.767**	0.082	0.458
	(0.177)	(0.115)	(0.205)	(0.159)	(0.181)	(0.326)	(0.331)	(0.289)
DY	0.014	0.007	0.016	0.021	0.007	-0.002	-0.047	-0.056
	(0.015)	(0.014)	(0.014)	(0.013)	(0.015)	(0.021)	(0.045)	(0.043)
STR	-0.001	0.003	-0.002	-0.002	-0.006	-0.008	-0.020**	-0.015
	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)	(0.008)	(0.010)	(0.009)
Constant (%)	-0.087	0.092	-0.061	-0.036	-0.001	-0.142	0.570*	0.590*
(%)	(0.120)	(0.120)	(0.131)	(0.108)	(0.123)	(0.232)	(0.322)	(0.302)
$Wald_1$	0.5781	0.7515	0.4394	0.2366	0.3293	0.5987	0.1271	0.2540
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.951	0.936	0.952	0.941	0.942	0.857	0.708	0.665
Observations	72	72	72	72	72	72	72	72

Low-Rated 50% Cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% low-rated portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.021***	0.994***	1.063***	1.095***	0.985***	1.002***	0.974***	0.972***
	(0.028)	(0.070)	(0.052)	(0.073)	(0.092)	(0.085)	(0.092)	(0.112)
SMB	0.244***	-0.013	0.245***	-0.067	0.149	-0.072	0.161	-0.058
	(0.042)	(0.075)	(0.067)	(0.079)	(0.098)	(0.095)	(0.099)	(0.120)
HML	0.015	-0.133	0.088	0.030	0.139	0.112	0.094	-0.013
	(0.068)	(0.094)	(0.082)	(0.098)	(0.123)	(0.153)	(0.124)	(0.150)
MOM	-0.063	-0.085	-0.011	0.008	-0.134*	-0.060	-0.127*	-0.061
	(0.046)	(0.056)	(0.070)	(0.059)	(0.073)	(0.081)	(0.074)	(0.090)
MKTRF_DY	-0.451	0.325	-0.439	-0.046	-1.516	-0.567	-1.062	-0.416
	(0.421)	(0.747)	(0.750)	(0.785)	(0.979)	(0.932)	(0.987)	(1.199)
SMB_DY	0.858	-0.543	-0.560	-0.890	0.301	0.453	0.767	0.851
	(0.767)	(1.139)	(1.568)	(1.197)	(1.492)	(1.929)	(1.504)	(1.827)
HML_DY	1.790**	-0.019	0.582	-1.137	2.142	1.208	1.713	0.586
	(0.698)	(1.126)	(1.005)	(1.184)	(1.475)	(1.079)	(1.488)	(1.807)
MOM_DY	0.349	-0.039	1.181*	0.771	-1.682*	-2.003***	-1.068	-1.889
	(0.434)	(0.721)	(0.703)	(0.757)	(0.944)	(0.717)	(0.952)	(1.156)
MKTRF_STR	-0.112**	0.021	-0.119*	0.008	-0.044	-0.081	-0.096	-0.144
	(0.045)	(0.096)	(0.070)	(0.101)	(0.126)	(0.104)	(0.127)	(0.155)
SMB_STR	0.152**	0.222*	0.169*	0.077	0.222	0.203	0.211	0.127
	(0.072)	(0.127)	(0.098)	(0.133)	(0.166)	(0.150)	(0.167)	(0.203)
HML_STR	-0.354***	-0.170	-0.164	0.152	-0.151	0.009	-0.260	-0.245
	(0.120)	(0.179)	(0.184)	(0.188)	(0.234)	(0.314)	(0.236)	(0.286)
MOM_STR	-0.044	-0.079	0.008	-0.023	-0.069	0.012	-0.084	-0.063
	(0.031)	(0.065)	(0.065)	(0.068)	(0.085)	(0.086)	(0.085)	(0.104)
DY	0.008	-0.017	0.000	-0.022	0.015	-0.025	0.012	-0.025
	(0.009)	(0.017)	(0.013)	(0.018)	(0.022)	(0.019)	(0.023)	(0.028)
STR	0.005***	0.005**	0.003	0.004	0.006*	0.003	0.007**	0.004
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Constant (%)	0.626***	0.218	0.465***	0.073	0.551**	0.276	0.546**	0.224
(%)	(0.136)	(0.167)	(0.171)	(0.175)	(0.218)	(0.275)	(0.220)	(0.267)
$Wald_1$	0.0092	0.1107	0.3520	0.2146	0.0774	0.3282	0.0578	0.4207
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.942	0.899	0.903	0.885	0.868	0.781	0.942	0.791
Observations	60	60	60	60	60	60	60	60

Low- Rated 50% Cut-off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% low-rated portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		**Product Innovation**		**Resource Reduction**		**Emission Reduction**	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.050***	1.016***	1.056***	0.952***	1.060***	1.013***	1.047***	1.001***
	(0.024)	(0.034)	(0.031)	(0.043)	(0.029)	(0.032)	(0.032)	(0.028)
SMB	0.328***	0.159**	0.355***	-0.006	0.396***	0.220***	0.461***	0.301***
	(0.053)	(0.074)	(0.068)	(0.094)	(0.064)	(0.074)	(0.070)	(0.063)
HML	0.128***	0.046	0.127**	-0.031	0.109**	-0.059	0.167***	0.002
	(0.039)	(0.055)	(0.050)	(0.070)	(0.048)	(0.059)	(0.052)	(0.047)
MOM	-0.080***	-0.085**	-0.170***	-0.080*	-0.119***	-0.025	-0.156***	-0.036
	(0.025)	(0.034)	(0.032)	(0.044)	(0.030)	(0.031)	(0.032)	(0.029)
MKTRF_DY	0.265***	0.256**	0.143	-0.258	0.193*	0.251*	0.078	0.022
	(0.088)	(0.124)	(0.113)	(0.157)	(0.107)	(0.141)	(0.116)	(0.105)
SMB_DY	0.400***	0.007	0.176	-0.223	0.136	0.315	0.339*	0.499***
	(0.141)	(0.198)	(0.181)	(0.252)	(0.172)	(0.217)	(0.186)	(0.168)
HML_DY	-0.596***	-0.881***	-0.684***	-0.363	-0.730***	-0.649***	-0.703***	-0.504***
	(0.152)	(0.213)	(0.195)	(0.271)	(0.184)	(0.226)	(0.199)	(0.180)
MOM_DY	-0.308***	-0.608***	-0.237**	-0.244*	-0.223**	-0.214*	-0.258**	-0.201**
	(0.074)	(0.104)	(0.095)	(0.133)	(0.090)	(0.109)	(0.098)	(0.088)
MKTRF_STR	-0.047	-0.070	-0.059	-0.251***	-0.085*	-0.138**	-0.092*	-0.131***
	(0.041)	(0.058)	(0.053)	(0.073)	(0.050)	(0.062)	(0.054)	(0.049)
SMB_STR	0.092	-0.105	0.061	-0.377**	0.046	-0.061	0.130	-0.012
	(0.087)	(0.122)	(0.112)	(0.155)	(0.106)	(0.106)	(0.114)	(0.103)
HML_STR	-0.052	-0.303**	-0.134	-0.322*	-0.134	-0.121	-0.179	-0.218*
	(0.096)	(0.134)	(0.123)	(0.171)	(0.117)	(0.149)	(0.126)	(0.114)
MOM_STR	0.015	-0.174**	-0.014	-0.099	-0.026	-0.098	-0.033	-0.030
	(0.047)	(0.066)	(0.061)	(0.084)	(0.058)	(0.079)	(0.062)	(0.056)
DY	-0.018***	-0.020***	-0.017***	-0.003	-0.013***	-0.012*	-0.012**	-0.005
	(0.004)	(0.006)	(0.005)	(0.007)	(0.005)	(0.007)	(0.005)	(0.005)
STR	-0.004**	-0.002	-0.005**	0.001	-0.003	0.000	-0.002	0.001
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Constant (%)	0.129	0.102	0.155	0.095	0.101	-0.046	0.141	0.024
(%)	(0.094)	(0.133)	(0.121)	(0.169)	(0.115)	(0.131)	(0.124)	(0.112)
$Wald_1$	0.0001	0.0018	0.0041	0.8606	0.0271	0.1525	0.0855	0.2646
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.989	0.957	0.982	0.947	0.984	0.972	0.982	0.981
Observations	72	72	72	72	72	72	72	72

Low-Rated 50% Cut-off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 50% low-rated portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.978***	0.913***	0.967***	0.932***	0.980***	0.954***	0.989***	1.035***
	(0.040)	(0.043)	(0.037)	(0.039)	(0.040)	(0.038)	(0.036)	(0.039)
SMB	0.633***	0.326***	0.590***	0.162***	0.622***	0.244***	0.632***	0.253***
	(0.044)	(0.047)	(0.040)	(0.042)	(0.044)	(0.034)	(0.043)	(0.042)
HML	0.044	-0.077	0.142***	0.027	0.071	0.012	0.048	-0.058
	(0.055)	(0.059)	(0.051)	(0.053)	(0.055)	(0.038)	(0.047)	(0.053)
MOM	-0.069	-0.030	-0.058	0.001	-0.083*	-0.039	-0.050	0.045
	(0.044)	(0.047)	(0.041)	(0.042)	(0.044)	(0.034)	(0.035)	(0.042)
MKTRF_DY	0.077	0.659	-0.059	0.050	0.158	0.555*	-0.104	0.432
	(0.392)	(0.417)	(0.361)	(0.374)	(0.389)	(0.285)	(0.350)	(0.375)
SMB_DY	0.405	0.642	-0.027	0.460	0.138	0.414	0.372	0.302
	(0.702)	(0.748)	(0.647)	(0.672)	(0.698)	(0.661)	(0.749)	(0.673)
HML_DY	-0.547	-0.656	0.339	-0.211	-0.455	-0.672	-0.392	-0.629
	(0.848)	(0.903)	(0.782)	(0.811)	(0.843)	(0.665)	(0.767)	(0.812)
MOM_DY	-0.234	0.019	-0.476	-0.720	-0.151	0.100	-0.444	-0.393
	(0.471)	(0.502)	(0.434)	(0.450)	(0.468)	(0.353)	(0.424)	(0.451)
MKTRF_STR	-0.054	-0.171	-0.039	-0.085	-0.105	-0.128	-0.065	-0.201
	(0.155)	(0.165)	(0.143)	(0.148)	(0.154)	(0.122)	(0.115)	(0.149)
SMB_STR	0.935***	1.057***	1.076***	0.348*	0.965***	0.516***	0.949***	0.545***
	(0.192)	(0.204)	(0.177)	(0.183)	(0.191)	(0.159)	(0.173)	(0.184)
HML_STR	0.365*	0.371	0.310	0.249	0.481**	0.474**	0.344*	0.285
	(0.211)	(0.225)	(0.194)	(0.202)	(0.209)	(0.179)	(0.191)	(0.202)
MOM_STR	0.423**	0.095	0.349**	-0.088	0.422**	0.051	0.399**	0.064
	(0.167)	(0.178)	(0.154)	(0.159)	(0.166)	(0.165)	(0.154)	(0.160)
DY	-0.016	-0.019	-0.013	-0.018	-0.017	-0.017	-0.008	-0.008
	(0.014)	(0.015)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.013)
STR	0.006	0.005	0.007*	0.001	0.007	0.005	0.004	0.004
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Constant (%)	0.091	0.040	0.056	0.014	0.096	-0.005	0.123	-0.013
(%)	(0.113)	(0.121)	(0.105)	(0.108)	(0.113)	(0.119)	(0.105)	(0.109)
$Wald_1$	0.1631	0.2172	0.1003	0.4043	0.1119	0.2027	0.4709	0.5269
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.963	0.944	0.967	0.947	0.963	0.950	0.971	0.958
Observations	72	72	72	72	72	72	72	72

Low-Rated 30% Cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% low-rated portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.027***	1.003***	0.999***	0.983***	0.988***	0.913***	0.983***	0.938***
	(0.042)	(0.095)	(0.065)	(0.112)	(0.060)	(0.079)	(0.069)	(0.085)
SMB	0.232***	-0.037	0.211**	-0.108	0.257***	-0.047	0.261***	-0.009
	(0.052)	(0.101)	(0.079)	(0.085)	(0.064)	(0.084)	(0.074)	(0.091)
HML	0.106	0.026	0.066	0.063	0.109	0.060	0.120	0.021
	(0.090)	(0.127)	(0.090)	(0.080)	(0.080)	(0.105)	(0.093)	(0.113)
MOM	-0.118*	-0.083	-0.035	-0.074	-0.051	-0.049	-0.079	-0.023
	(0.068)	(0.076)	(0.086)	(0.063)	(0.048)	(0.063)	(0.056)	(0.068)
MKTRF_DY	-1.138**	-0.367	-0.526	-0.895	-0.507	0.146	-0.405	1.042
	(0.515)	(1.010)	(0.962)	(0.939)	(0.640)	(0.841)	(0.742)	(0.905)
SMB_DY	-0.205	-0.519	-0.160	0.093	1.248	-0.931	0.254	-1.325
	(0.885)	(1.540)	(1.921)	(1.305)	(0.975)	(1.282)	(1.131)	(1.379)
HML_DY	2.043**	0.407	0.559	-0.950	2.440**	0.278	2.466**	0.618
	(0.981)	(1.523)	(1.010)	(1.109)	(0.965)	(1.268)	(1.119)	(1.364)
MOM_DY	0.219	-0.838	1.091	0.385	0.661	0.347	0.954	1.090
	(0.592)	(0.975)	(0.838)	(0.759)	(0.617)	(0.811)	(0.716)	(0.873)
MKTRF_STR	-0.234***	-0.193	-0.197**	-0.112	-0.139*	-0.084	-0.167*	-0.119
	(0.068)	(0.130)	(0.094)	(0.140)	(0.083)	(0.109)	(0.096)	(0.117)
SMB_STR	0.334***	0.293*	0.162	0.029	0.107	0.321**	0.196	0.199
	(0.074)	(0.171)	(0.118)	(0.117)	(0.109)	(0.143)	(0.126)	(0.153)
HML_STR	-0.220	-0.056	-0.266	-0.061	-0.378**	-0.115	-0.399**	-0.222
	(0.178)	(0.241)	(0.209)	(0.233)	(0.153)	(0.201)	(0.177)	(0.216)
MOM_STR	-0.025	-0.075	0.016	-0.085	0.011	0.059	-0.010	0.006
	(0.056)	(0.087)	(0.065)	(0.081)	(0.055)	(0.073)	(0.064)	(0.078)
DY	0.028***	-0.017	0.003	-0.020	0.020	0.002	0.031*	0.000
	(0.008)	(0.023)	(0.016)	(0.020)	(0.015)	(0.019)	(0.017)	(0.021)
STR	0.005**	0.005	0.002	0.002	0.004**	0.004	0.005*	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Constant (%)	0.543***	0.257	0.658***	0.316	0.728***	0.354*	0.746***	0.363*
(%)	(0.180)	(0.225)	(0.204)	(0.268)	(0.143)	(0.188)	(0.166)	(0.202)
$Wald_1$	0.0009	0.2897	0.7686	0.5517	0.0184	0.2768	0.0104	0.3394
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.916	0.840	0.870	0.810	0.943	0.861	0.925	0.847
Observations	60	60	60	60	60	60	60	60

Low-Rated 30% Cut-off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% low-rated portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.028***	0.946***	1.060***	0.924***	0.966***	0.939***	1.006***	0.921***
	(0.031)	(0.044)	(0.023)	(0.034)	(0.066)	(0.040)	(0.029)	(0.037)
SMB	0.364***	0.160**	0.421***	0.180*	0.414***	0.195**	0.431***	0.247***
	(0.067)	(0.071)	(0.095)	(0.097)	(0.105)	(0.080)	(0.072)	(0.072)
HML	0.203***	0.035	0.185***	0.031	0.455***	0.037	0.274***	0.079
	(0.050)	(0.073)	(0.045)	(0.062)	(0.108)	(0.071)	(0.054)	(0.066)
MOM	-0.112***	-0.027	-0.208***	-0.121***	-0.143***	-0.046	-0.101***	-0.028
	(0.031)	(0.033)	(0.043)	(0.045)	(0.046)	(0.039)	(0.025)	(0.035)
MKTRF_DY	0.178	0.132	0.132	0.180	0.231	0.124	0.055	0.015
	(0.112)	(0.154)	(0.205)	(0.192)	(0.175)	(0.113)	(0.146)	(0.128)
SMB_DY	0.180	0.326*	0.179	0.243	0.156	0.252	0.339*	0.499**
	(0.180)	(0.192)	(0.303)	(0.293)	(0.318)	(0.229)	(0.188)	(0.189)
HML_DY	-0.731***	-0.630***	-0.740***	-0.458**	-0.186	-0.477**	-0.700***	-0.459**
	(0.193)	(0.231)	(0.127)	(0.208)	(0.259)	(0.238)	(0.174)	(0.211)
MOM_DY	-0.072	-0.154	-0.178*	-0.145	0.486***	-0.129	-0.027	-0.103
	(0.095)	(0.110)	(0.093)	(0.108)	(0.123)	(0.104)	(0.085)	(0.103)
MKTRF_STR	-0.065	-0.135*	-0.065	-0.098	0.175*	-0.144**	-0.108*	-0.158**
	(0.052)	(0.077)	(0.069)	(0.077)	(0.088)	(0.067)	(0.064)	(0.070)
SMB_STR	-0.007	-0.102	0.072	-0.162	0.003	-0.143	0.086	-0.033
	(0.111)	(0.104)	(0.113)	(0.116)	(0.148)	(0.126)	(0.091)	(0.093)
HML_STR	-0.210*	-0.338**	-0.111	-0.128	-0.106	-0.280*	-0.258	-0.278*
	(0.122)	(0.153)	(0.164)	(0.144)	(0.170)	(0.151)	(0.161)	(0.151)
MOM_STR	0.083	-0.029	-0.036	-0.164**	0.448***	-0.072	0.074	0.011
	(0.060)	(0.086)	(0.083)	(0.072)	(0.076)	(0.049)	(0.071)	(0.055)
DY	-0.010**	-0.005	-0.012*	-0.009	0.007	-0.004	-0.004	-0.003
	(0.005)	(0.007)	(0.006)	(0.006)	(0.008)	(0.005)	(0.007)	(0.006)
STR	-0.003	0.002	-0.005	-0.000	-0.004	0.003	-0.002	0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)
Constant (%)	0.233*	0.001	0.302***	0.189*	0.334*	0.031	0.250**	0.102
(%)	(0.121)	(0.001)	(0.092)	(0.106)	(0.198)	(0.129)	(0.121)	(0.127)
$Wald_1$	0.1332	0.4824	0.0948	0.2717	0.0155	0.2266	0.7687	0.3094
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.982	0.965	0.978	0.959	0.979	0.968	0.979	0.969
Observations	72	72	72	72	72	72	72	72

Low-Rated 30% Cut-off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 30% low-rated portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.977***	0.952***	0.958***	0.893***	1.002***	1.002***	1.008***	0.978***
	(0.049)	(0.046)	(0.050)	(0.057)	(0.043)	(0.048)	(0.048)	(0.051)
SMB	0.679***	0.269***	0.605***	0.146**	0.677***	0.311***	0.703***	0.272***
	(0.053)	(0.050)	(0.054)	(0.061)	(0.047)	(0.052)	(0.052)	(0.056)
HML	0.116*	0.109*	0.124*	-0.080	0.043	0.134**	0.009	-0.014
	(0.067)	(0.064)	(0.069)	(0.078)	(0.059)	(0.066)	(0.066)	(0.071)
MOM	-0.003	0.052	-0.115**	-0.069	-0.059	0.023	-0.035	0.065
	(0.053)	(0.051)	(0.054)	(0.061)	(0.047)	(0.052)	(0.052)	(0.056)
MKTRF_DY	0.050	-0.286	-0.190	-0.017	0.076	-0.822*	-0.023	-0.221
	(0.470)	(0.450)	(0.485)	(0.547)	(0.417)	(0.468)	(0.465)	(0.498)
SMB_DY	-0.169	-0.845	-0.206	0.216	0.278	-1.476*	0.109	-0.715
	(0.843)	(0.807)	(0.870)	(0.982)	(0.748)	(0.839)	(0.834)	(0.894)
HML_DY	-0.256	-1.247	0.914	-0.685	-0.370	-2.114**	-0.824	-0.691
	(1.018)	(0.975)	(1.050)	(1.185)	(0.903)	(1.012)	(1.007)	(1.079)
MOM_DY	-0.457	-1.334**	-0.616	-0.665	0.041	-1.515***	-0.140	-1.101*
	(0.565)	(0.541)	(0.583)	(0.658)	(0.502)	(0.562)	(0.559)	(0.599)
MKTRF_STR	-0.020	0.061	-0.157	-0.065	-0.088	0.072	-0.079	-0.025
	(0.186)	(0.178)	(0.192)	(0.217)	(0.165)	(0.185)	(0.184)	(0.197)
SMB_STR	1.185***	0.922***	1.209***	0.323	0.997***	0.962***	1.044***	0.476*
	(0.230)	(0.221)	(0.238)	(0.268)	(0.204)	(0.229)	(0.228)	(0.244)
HML_STR	0.573**	0.476*	0.060	0.132	0.477**	0.801***	0.432*	0.401
	(0.253)	(0.242)	(0.261)	(0.295)	(0.224)	(0.252)	(0.250)	(0.268)
MOM_STR	0.565***	0.164	0.226	-0.070	0.391**	0.202	0.469**	0.022
	(0.200)	(0.192)	(0.206)	(0.233)	(0.178)	(0.199)	(0.198)	(0.212)
DY	-0.022	-0.033**	-0.020	-0.030	-0.021	-0.044**	-0.018	-0.022
	(0.017)	(0.016)	(0.017)	(0.019)	(0.015)	(0.017)	(0.017)	(0.018)
STR	0.010*	0.005	0.010**	-0.001	0.007	0.006	0.006	0.000
	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)	(0.005)
Constant (%)	0.139	-0.008	0.114	-0.010	0.184	0.162	0.179	0.145
(%)	(0.136)	(0.130)	(0.140)	(0.159)	(0.131)	(0.135)	(0.135)	(0.144)
$Wald_1$	0.0625	0.0607	0.0652	0.3181	0.1975	0.0160	0.2298	0.4712
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.947	0.931	0.942	0.886	0.959	0.931	0.951	0.916
Observations	72	72	72	72	72	72	72	72

Low-Rated 10% Cut-off 2003-2007

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% low-rated portfolio between 2003 and 2007. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.145***	1.019***	1.050***	0.952***	1.091***	1.075***	1.056***	0.997***
	(0.109)	(0.117)	(0.112)	(0.141)	(0.117)	(0.102)	(0.104)	(0.113)
SMB	0.019	-0.164	0.127	-0.083	-0.047	-0.166	0.078	-0.087
	(0.139)	(0.126)	(0.120)	(0.151)	(0.126)	(0.133)	(0.111)	(0.142)
HML	0.164	0.082	-0.144	-0.053	0.385**	0.272	0.330**	0.124
	(0.169)	(0.157)	(0.150)	(0.189)	(0.157)	(0.167)	(0.139)	(0.143)
MOM	-0.134	-0.113	0.014	0.018	-0.128	-0.093	-0.229***	-0.150*
	(0.109)	(0.094)	(0.089)	(0.113)	(0.094)	(0.084)	(0.083)	(0.087)
MKTRF_DY	0.366	-0.125	0.595	0.636	-0.071	0.499	-0.953	0.141
	(1.115)	(1.255)	(1.196)	(1.505)	(1.254)	(0.925)	(1.110)	(1.059)
SMB_DY	-1.403	-1.805	1.233	1.743	0.447	1.666	-1.977	0.485
	(2.021)	(1.912)	(1.822)	(2.293)	(1.912)	(2.280)	(1.691)	(1.848)
HML_DY	0.856	-1.755	3.944**	1.087	0.996	-0.507	1.948	1.022
	(1.208)	(1.891)	(1.802)	(2.268)	(1.891)	(1.461)	(1.673)	(1.170)
MOM_DY	1.643	0.881	1.494	0.087	-0.902	-2.194**	-0.094	-1.768**
	(1.060)	(1.210)	(1.153)	(1.451)	(1.210)	(0.864)	(1.070)	(0.764)
MKTRF_STR	-0.120	-0.216	-0.397**	-0.246	0.148	0.206	-0.047	0.061
	(0.148)	(0.162)	(0.154)	(0.194)	(0.162)	(0.128)	(0.143)	(0.136)
SMB_STR	0.202	0.356	0.223	-0.061	-0.043	-0.134	0.254	-0.057
	(0.228)	(0.213)	(0.203)	(0.255)	(0.213)	(0.199)	(0.188)	(0.182)
HML_STR	-0.261	-0.052	-0.526*	-0.437	-0.082	0.268	-0.234	-0.002
	(0.296)	(0.300)	(0.286)	(0.360)	(0.300)	(0.313)	(0.265)	(0.271)
MOM_STR	-0.087	-0.213*	-0.179*	-0.303**	0.042	-0.039	-0.124	-0.151
	(0.092)	(0.109)	(0.103)	(0.130)	(0.109)	(0.102)	(0.096)	(0.109)
DY	0.014	-0.021	-0.052*	-0.051	0.018	-0.034	0.055**	-0.008
	(0.019)	(0.029)	(0.027)	(0.035)	(0.029)	(0.024)	(0.025)	(0.018)
STR	0.001	0.004	0.000	0.002	0.003	0.002	0.008**	0.004
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)
Constant (%)	0.585**	0.255	0.830***	0.571*	0.111	0.003	0.305	0.139
(%)	(0.284)	(0.280)	(0.267)	(0.336)	(0.280)	(0.254)	(0.248)	(0.267)
$Wald_1$	0.6386	0.4771	0.1613	0.3507	0.4994	0.3273	0.0029	0.5245
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.794	0.735	0.825	0.649	0.803	0.755	0.846	0.767
Observations	72	72	72	72	72	72	72	72

Low-Rated 10% Cut-off 2008-2013

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% low-rated portfolio between 2008 and 2013. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1, Wald_2, Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	0.960***	0.749***	1.086***	0.982***	0.966***	0.818***	0.969***	0.930***
	(0.055)	(0.085)	(0.046)	(0.052)	(0.066)	(0.082)	(0.070)	(0.123)
SMB	0.291**	0.160*	0.350***	0.237**	0.414***	0.095	0.448***	-0.114
	(0.121)	(0.094)	(0.102)	(0.116)	(0.105)	(0.117)	(0.114)	(0.171)
HML	0.448***	0.185	0.088	-0.056	0.455***	0.195	0.549***	0.597***
	(0.090)	(0.179)	(0.076)	(0.086)	(0.108)	(0.159)	(0.125)	(0.186)
MOM	-0.027	0.071	-0.083*	0.016	-0.143***	1.107	-0.110**	-0.406***
	(0.056)	(0.074)	(0.047)	(0.054)	(0.046)	(1.147)	(0.049)	(0.107)
MKTRF_DY	0.523**	0.318	0.338*	0.308	0.231	0.269	0.106	0.146
	(0.202)	(0.207)	(0.170)	(0.193)	(0.175)	(0.262)	(0.158)	(0.419)
SMB_DY	-0.156	0.532*	0.130	0.244	0.156	0.319	0.207	-0.622
	(0.324)	(0.314)	(0.273)	(0.309)	(0.318)	(0.333)	(0.312)	(0.485)
HML_DY	-0.334	-0.476	-0.962***	-0.720**	-0.186	-0.500	-0.482	-0.714
	(0.347)	(0.418)	(0.293)	(0.332)	(0.259)	(0.329)	(0.295)	(0.537)
MOM_DY	0.461***	0.156	-0.172	-0.076	0.486***	-1.340	0.218**	-0.651**
	(0.170)	(0.150)	(0.144)	(0.163)	(0.123)	(2.466)	(0.100)	(0.269)
MKTRF_STR	0.068	-0.076	0.037	0.198**	0.175*	-0.128	0.011	-0.091
	(0.094)	(0.117)	(0.079)	(0.090)	(0.088)	(0.098)	(0.085)	(0.156)
SMB_STR	-0.096	0.061	-0.111	-0.381**	0.003	0.244	-0.037	0.040
	(0.199)	(0.183)	(0.168)	(0.190)	(0.148)	(0.238)	(0.167)	(0.278)
HML_STR	-0.016	-0.249	-0.075	-0.189	-0.106	-0.570***	-0.218	-0.751*
	(0.219)	(0.227)	(0.185)	(0.210)	(0.170)	(0.214)	(0.207)	(0.415)
MOM_STR	0.480***	0.158	0.089	0.035	0.448***	0.800	0.293***	-0.283
	(0.108)	(0.103)	(0.091)	(0.103)	(0.076)	(0.575)	(0.087)	(0.194)
DY	0.005	0.005	-0.011	-0.010	0.007	0.009	0.004	-0.015
	(0.009)	(0.010)	(0.008)	(0.009)	(0.008)	(0.012)	(0.009)	(0.015)
STR	-0.004	0.005	-0.008**	-0.005	-0.004	-0.007	-0.001	-0.001
	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.006)	(0.003)	(0.008)
Constant (%)	0.394*	0.139	0.143	-0.189	0.334*	0.264	0.377*	0.749**
(%)	(0.216)	(0.246)	(0.183)	(0.207)	(0.198)	(0.211)	(0.219)	(0.358)
$Wald_1$	0.3363	0.4194	0.0649	0.3782	0.0155	0.6778	0.7017	0.5930
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.394*	0.139	0.143	-0.189	0.334*	0.264	0.377*	0.749**
Adjusted R-squared	0.943	0.867	0.959	0.921	0.958	0.925	0.956	0.899
Observations	72	72	72	72	72	72	72	72

Low-Rated 10% Cut-off 2014-2019

This table presents the regression estimates for the conditional version of the Carhart (1997) 4-factor-model applied to 10% low-rated portfolio between 2014 and 2019. MKTRF represents the excess return of the market portfolio over the risk-free rate, SMB represents the return difference between a small and a large cap portfolio, HML represents the return difference between a high and a low book-to-market portfolio, MOM represents the return difference between portfolios of stocks with high and low returns in the past twelve months. DY and STR represent the public information variables Dividend Yield and Short-term Rate. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix. ***, ** and *indicate significance at the 1%, 5%, and 10% level, respectively. $Wald_1$, $Wald_2$, $Wald_3$ correspond to the probability of not rejecting the null hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	Environmental		Product Innovation		Resource Reduction		Emission Reduction	
VARIABLES	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted	Equally-weighted	Value-weighted
MKTRF	1.023***	1.008***	1.000***	0.930***	0.908***	0.973***	0.932***	0.954***
	(0.067)	(0.062)	(0.044)	(0.044)	(0.049)	(0.036)	(0.054)	(0.052)
SMB	0.649***	0.115*	0.455***	0.091*	0.567***	0.155***	0.531***	0.120**
	(0.072)	(0.067)	(0.048)	(0.048)	(0.050)	(0.036)	(0.059)	(0.056)
HML	0.486***	0.319***	0.289***	0.096	0.184*	0.206***	0.391***	0.174**
	(0.092)	(0.085)	(0.060)	(0.060)	(0.098)	(0.052)	(0.074)	(0.071)
MOM	0.120	0.129*	-0.105**	-0.033	-0.057	0.040	0.029	0.102*
	(0.073)	(0.067)	(0.048)	(0.048)	(0.050)	(0.043)	(0.059)	(0.057)
MKTRF_DY	0.218	-0.285	-0.077	0.237	0.759*	-0.353	0.569	0.033
	(0.648)	(0.600)	(0.425)	(0.427)	(0.430)	(0.292)	(0.524)	(0.505)
SMB_DY	-0.168	-1.449	0.259	0.626	0.446	-0.152	0.046	0.529
	(1.162)	(1.076)	(0.763)	(0.766)	(0.928)	(0.772)	(0.940)	(0.905)
HML_DY	-1.042	-1.518	1.626*	-0.059	-1.605	-1.404	-1.195	-1.053
	(1.402)	(1.299)	(0.921)	(0.925)	(1.376)	(0.857)	(1.134)	(1.092)
MOM_DY	-0.466	-1.468**	-0.336	-0.296	1.203**	-0.359	-0.163	-0.505
	(0.779)	(0.721)	(0.512)	(0.514)	(0.546)	(0.487)	(0.630)	(0.607)
MKTRF_STR	0.009	-0.030	-0.269	-0.213	-0.097	-0.184	-0.078	-0.065
	(0.257)	(0.238)	(0.169)	(0.169)	(0.211)	(0.140)	(0.208)	(0.200)
SMB_STR	1.298***	0.613**	0.700***	-0.045	0.394	0.578***	0.905***	0.204
	(0.317)	(0.294)	(0.208)	(0.209)	(0.258)	(0.194)	(0.257)	(0.247)
HML_STR	0.448	0.112	-0.067	-0.077	0.722**	0.370**	0.462	0.118
	(0.349)	(0.323)	(0.229)	(0.230)	(0.290)	(0.172)	(0.282)	(0.272)
MOM_STR	0.342	-0.151	-0.108	-0.302	0.138	-0.195	0.090	-0.235
	(0.276)	(0.255)	(0.181)	(0.182)	(0.221)	(0.157)	(0.223)	(0.215)
DY	-0.019	-0.037*	-0.002	-0.028*	0.010	-0.005	-0.011	-0.013
	(0.023)	(0.021)	(0.015)	(0.015)	(0.020)	(0.016)	(0.019)	(0.018)
STR	0.008	0.004	0.004	0.002	0.003	0.001	0.006	0.004
	(0.007)	(0.006)	(0.005)	(0.005)	(0.006)	(0.004)	(0.006)	(0.005)
Constant (%)	0.289	0.129	-0.176	-0.102	0.251*	0.124	0.196	0.214
(%)	(0.188)	(0.174)	(0.123)	(0.124)	(0.148)	(0.114)	(0.152)	(0.146)
$Wald_1$	0.3411	0.1628	0.6980	0.1742	0.7452	0.9175	0.4561	0.5206
$Wald_2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
$Wald_3$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Adjusted R-squared	0.906	0.876	0.953	0.927	0.924	0.925	0.927	0.901
Observations	72	72	72	72	72	72	72	72